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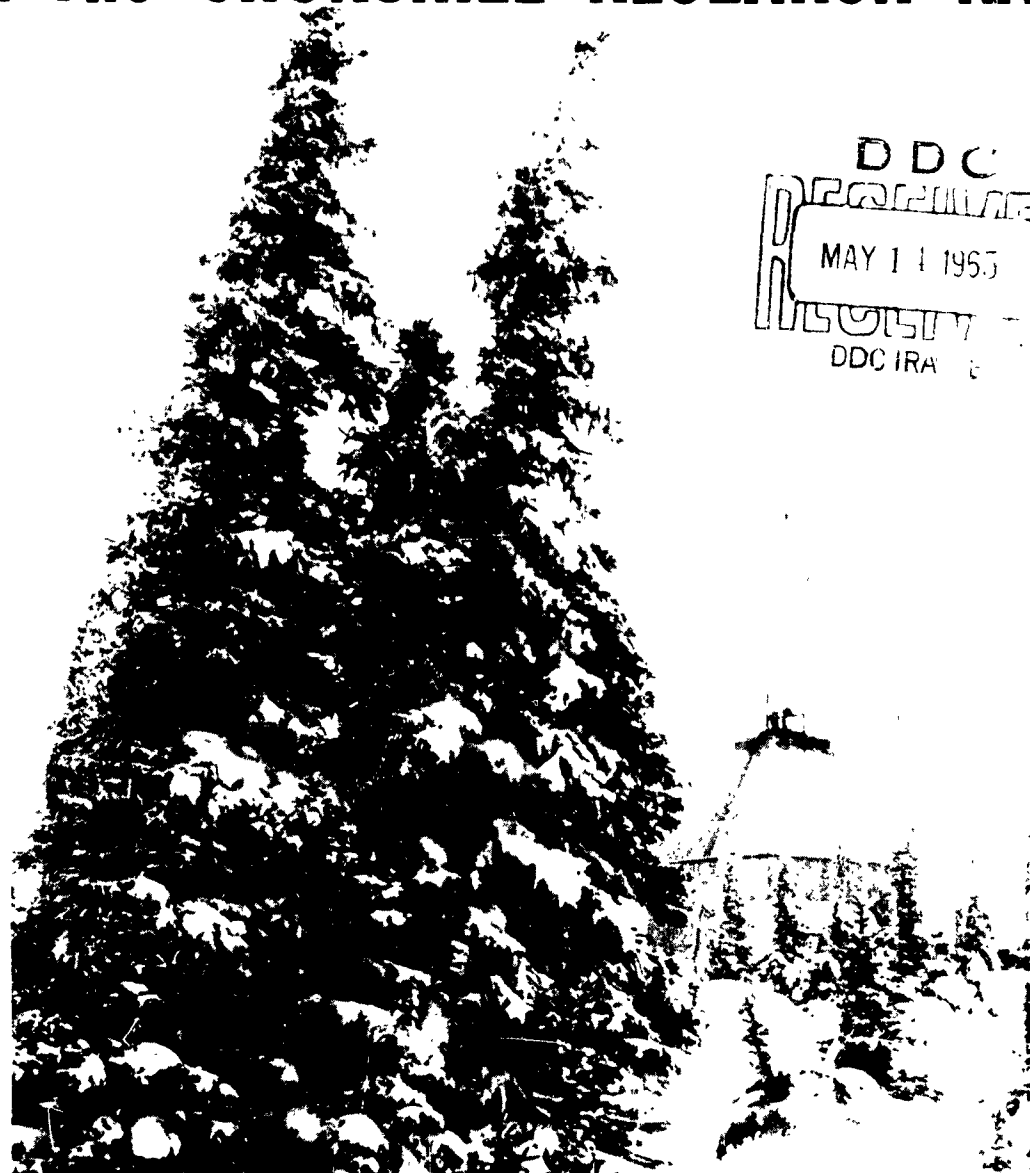
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# The CHURCHILL RESEARCH RANGE

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A History of its Acquisition &  
Management by the Air Force

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Office of Aerospace Research ★ U. S. Air Force



# **THE CHURCHILL RESEARCH RANGE**

**A History of  
Its Acquisition and Management  
by the Air Force**

by  
Robert F. Phillips

**Historical Division  
Office of Information  
Office of Aerospace Research  
Washington, D. C.**

**1964**

## PREFACE

The Churchill Research Range (CRR) at Fort Churchill, Manitoba, Canada, while small in both size and resources, is certainly the most unique among those units that make up the Office of Aerospace Research. For example, it is located in the coldest place in North America; it is the only range in the world where rockets are fired from buildings; and it is the only U.S. range that boasts polar bears that nose around the launch area and the base camp much as do stray dogs in a typical urban area. It is different, too, in that OAR personnel merely administer the range, while Pan American World Airways, on a contract basis, actually performs the various operations. The range is maintained not only for OAR's use, but for other users such as the National Aeronautics and Space Administration, the U.S. Navy and Canadian research agencies.

Although it does not fit easily into the categories commonly used in discussing Air Force research programs, CRR is an Air Force research installation whose work has won general recognition as equal to the best that is being done elsewhere in the same field. And being done under extremely trying conditions, it might be added. For this reason, among others, the history of CRR is worth a thorough examination. While the topic may serve as a case study in Air Force research operations, it also constitutes a small but important chapter in the general history of American rocketry.

This history does not pretend to be definitive. Its primary concern is an adequate coverage of the details behind the acquisition of the CRR by the Air Force and the subsequent rehabilitation of the range during its first year under Air Force management. It is told from the Air Force point of view, so only those phases of Army, NASA, PAA and Canadian operations that were considered pertinent to the clarification of the Air Force story were touched upon. The resulting treatment will, I hope, prove useful to both scientists and administrators, and to anyone else with an interest in the CRR or in the U.S. rocket program in general.

In the preparation of this history, valuable assistance has been received from a great many individuals at Headquarters, Office of Aerospace Research, and at the Churchill Research Range as well as others from Headquarters, USAF, and the Operational Coordinating Group. Without such widespread cooperation, this history could scarcely have been written. Above all, thanks are due to Colonel Jerry F. Flicek, former Commander of CRR, and his staff; Lieutenant Colonel Claude R. Kimbrel, formerly of Headquarters OAR and now Commanding Officer of CRR; Colonel Jack W. Streeton and Captain Raymond R. Keys, both of Headquarters OAR; Lieutenant Colonel Leon Stone, Headquarters USAF (AFRST); and Lieutenant Colonel Dale Denman, Jr., formerly of OSD. These officers personally answered questions about the Churchill Research Range and related topics, made available important source materials, and examined portions of the manuscript in semi-final form. Help was also forthcoming from other Headquarters OAR personnel who were connected with the Churchill operation such as Colonel John R. Fowler, Major Douglas C. Conley and Major John J. Apple. Despite this assistance, responsibility for the final version of this history -- and for any shortcomings that may be detected in it -- rests solely with the author.

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September 1964

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WHY CHURCHILL?<sup>1</sup>

The general reaction from most individuals, upon learning that the U.S. Air Force's Office of Aerospace Research (OAR) is managing a rocket research range at Fort Churchill in the frozen wastelands of Canada only 7° below the Arctic Circle, is one of amazement. Why, it is asked, is the Air Force operating a range there when it has ranges in Florida and California that could be used just as well?

The answer is relatively uncomplicated. Operationally the Air Force ranges in Florida and California would do just as well; but for the kind of scientific data OAR is seeking at Churchill, these ranges would not do at all. Many years back, scientists, in carrying out basic research activities, recognized the importance of scientific information which can only be collected at high altitude and latitude. Experiments of this nature can all be performed in the auroral zone. In fact, some of the experiments can be performed only in the auroral zone.

There have been suggestions to the effect that experiments can be done just as easily by satellite. This is not so. For this type of experiment to be feasible, a satellite would have to have an extreme elliptic orbit to perform the task of a sounding rocket and, even then, would not be able to collect data at low altitudes. In reality the two vehicles complement each other; satellites in circular orbits being useful for data collection along a track parallel to the earth's surface and rockets being used to study vertical distribution of the parameter of interest.

In conducting experiments with rockets in the auroral zone, it was first necessary to locate the best possible location along the rough circle which is the northern auroral

zone. This circle touches the southern tip of Greenland, the southern coast of Iceland, the northernmost tip of Norway, cuts across the Taymyr Peninsula in the Soviet Union, runs well south of Point Barrow, Alaska, and through the Fort Churchill area in Manitoba, Canada. The Taymyr Peninsula could not be considered for obvious reasons, and because of varying degrees of difficulty of operation and inaccessibility, none of the other locations was by any means ideal. From the point of view of accessibility Fort Churchill was by far the best, for it was the most accessible from the United States of any of the locations considered by either water, rail or air transportation. Then, too, it was in a friendly country and it was a permanent Canadian defense base. It was because of its location and relative accessibility that the Churchill range was selected as the main northern North American rocket and balloon launch facility for the International Geophysical Year (IGY).

And, of course, Churchill was perfectly suitable from the scientific point of view. Churchill is the geomagnetic conjugate of the U.S. Little America base in the Antarctic. This can be important to experiments that involve particles whose trajectories are determined by the magnetic lines of force. It also lies near the 80th meridian -- this is important to studies that are longitude sensitive. There is no other location in the auroral zone which offers as many advantages.

## AURORAL ZONE RESEARCH

We might now look at the several kinds of experiments that must be performed at northern latitudes, and most efficiently, in

<sup>1</sup> This chapter is based on a report by Ray R. Heer, Jr., "Justification for Research Rocket Facility at High Latitude," 12 Feb 62.

auroral zones. The first of these types of research and experiments are those associated with aurorae. Aurorae are associated with ionospheric electron density, which, in turn, is related to Polar Blackout of radio communications and with anomalous propagation (uneven transmission of energy). In order to learn more about these effects, which interfere with, reduce, or obliterate Air Force communications capability in the Arctic, it is first necessary to learn more about the aurorae. Morphology, spectrographic characteristics, excitation processes, corpuscular effects, radio interference and structure are all examples of auroral parameters that are being studied. Experiments that fly spectrometers into active aurora, with the purpose of better understanding the fundamental processes and necessary conditions which culminate in aurorae, have already been performed. More experiments of this nature are planned. It is necessary to make these spectrometer observations above the bulk of the atmosphere since much of the effect to be observed is in either the ultra violet or infra red part of the spectrum and is, therefore, not observable at ground level because of absorption by atmospheric gases. Also to be determined are the frequency of occurrences of aurorae and ground cover -- north-south extent and east-west movement. Another matter of interest which will be explored will be a comparison of auroral activity and night airglow emissions. Other experiments -- these with simultaneous transmissions from rockets and radar reflections -- will be used to study ion density characteristics and changes. In addition, changes -- either in intensity and/or direction -- in the magnetic field of the earth during times of aurorae will be studied because of their great practical interest to the Air Force.

#### ION STUDY

Another class of high latitude research that needs to be continued is ion study. If one keeps in mind that ionospheric phenomena are latitude sensitive, it should be evident that simultaneous studies at a

variety of latitudes are necessary in order to obtain a true representation of the ionosphere as it surrounds the earth. The auroral latitudes, when the object of study is the aurora, electron and ion density and electron energy distribution in the various layers (D, E, and F) of the ionosphere, are particularly interesting in this respect.

Probably the most interesting region in the auroral zone is the D region, 70 to 100 kilometers up. In this region the ion population changes very rapidly from time to time, and if the region becomes too densely populated, a communications blackout may result. Electron density and any variations thereof are quantities that must be known. Experiments to further Air Force knowledge in this area will be performed by flying a RF (radio frequency) probe through this D region. Measurement of the differential absorption as a flight traverses this region is another type of experiment performed in the D region. Normally this type of experiment will be performed by using a transmitter on the rocket and a receiver on the ground to measure the signal strength at various frequencies. It is possible to reverse the relative position of transmitter and receiver; this will be done in some studies. These experiments will be coordinated with ground-based experiments with riometers, which measure reflected signals. The most practical importance of these particular experiments will be in our increased understanding of Polar Cap Absorption phenomena. It is hoped that this understanding will enable us to improve our communications capability in the frequency range of less than 100 Mc/sec.

Positive ions and electron densities also have to be measured in this region. From a knowledge of these densities, scientists can calculate the absorption and refraction of waves at all radar frequencies. One type of experiment that can only be accomplished in the auroral zone is that involving the production of X-rays at times of Polar Cap Absorption. Electronic guidance problems may be somewhat alleviated when the aforementioned knowledge of the shape and magnitude of the earth's magnetic field at high altitudes is gathered at many different latitudes. These experiments are especially



important at high latitudes where the field changes rapidly with change in altitude. Guidance or navigation systems that make use of the magnetic field of the earth are especially affected by this experiment. These particular measurements will extend above the D region into the E and F region, which extend from about 100 km to about 400 km. Precise measurements on satellite drag can and must be made in the E and F regions. The resultant measurements can be interpreted in terms of the shape of the earth and are important to geodists in the explicit location of land masses. They are also necessary for the construction of a better and more accurate model of the geoid, and the information thus gained will help alleviate some of the problems associated with inertial guidance systems. Insofar as other types of experiments are concerned, electron energies should be determined in this region. For if a relationship between these energies and the kinetic energies can be defined, some insight into the mechanism of auroral heating may be gained. If we are to further our knowledge of how the various ionized layers vary with latitude, it is necessary to find out these things. It must be kept in mind, however, that many of the needs which have so far been pointed out are not peculiar to this latitude; to give an accurate, complete picture of near space it will be necessary to determine them at many latitudes.

At still higher altitudes, that is around 400 km or above the F<sub>2</sub> peak, there is a need to know the electron density profile with altitude and to interpret radio propagation experiments in terms of this knowledge. For these purposes the atmospheric temperature, density, and composition should be determined. Recently a helium belt was found which, it is supposed, is latitude dependent; the experiment which discovered this belt should be repeated at auroral latitudes. The spread F condition and its relation to multiple reflections needs to be determined. This is by no means an exhaustive listing of the ionospheric experiments which can be done by means of rockets at high latitude, but represents very well the type of work that should be performed in this field.

The possibility of recording important measurements of electron density, and changes thereof, in the ionosphere during an eclipse presented another argument for the Churchill location. (For instance, the eclipse of 20 July 1963 lasted about two and a quarter hours at Churchill and reached 94 percent totality on the ground and 91 percent totality at 100 km.) Measurements at such times will be most informative about the D, E and F<sub>1</sub> regions (< 250 km), for changes take place much more slowly in these regions than in the F<sub>2</sub> region. The F<sub>2</sub> region is less regular and it is much more difficult to associate disturbances in it with the eclipse, so any measurements made in that region will be less instructive. Fully as important as a knowledge of these electron density changes is whether these changes are of the recombination or attachment type. This is possible only through a study of the ionizing radiation as well as the electron density. Of special importance in this respect is the X-radiation which, since it arises in the unclipped corona, should be relatively unchanged. Simultaneous measurement of the ionizing radiation and the ions produced is important and is possible through the use of Langmuir probes, radio-frequency probes, and ion traps. Measurements of this nature tell scientists much about the vertical movement of the ionosphere and the radiation distribution over the solar disc.

#### COSMIC RAYS AND RADIATION ZONES

Cosmic radiation, of course, is also latitude sensitive. By this is meant that for a cosmic ray particle to penetrate to a given altitude it need possess less energy per nucleon as its latitude of penetration increases. This statement assumes that (and admittedly it is an over-simplification of the matter), for the particles being compared, the angle of penetration (angle between direction of propagation and earth radii at point of penetration) is the same. As far as cosmic ray energies are concerned, the particulate radiation that comes from the sun is low energy. It can only penetrate the earth's magnetic field at high latitudes. Solar particles are mainly protons -- ionized

atomic hydrogen. Recent experiments demonstrate that the sun also emits alpha particles -- i.e., helium nuclei -- and particles with charge equal to or greater than three. It is these solar particles that are the basis of the intense biological hazard during and after solar flares. The biological hazard associated with a particle is a function of charge and energy. If the composition, spectrum and flux of the solar beam is not well known and not completely understood, it becomes increasingly difficult to accurately evaluate the biological hazard. Some data has been collected at northern latitudes; the collection period should continue for at least an 11-year solar cycle if positive results are to be achieved. No available or existing facility now serving as a launch site for such collection offers as many advantages as Fort Churchill. It is further recognized that there is also a need for balloon launch facilities. This will be discussed later. Balloon flights alone, however, will not suffice to investigate the heavy primaries which are of low enough energy that they do not penetrate to balloon altitudes. In order to completely cover the zone of interest, rocket probes are necessary. Fort Churchill is the ideal place to study the particles that get dumped from the outer radiation zone and to attempt to associate the dumping with other geophysical phenomena, for the horns of the outer Radiation Zone come closest to the earth at that latitude. Furthermore, it provides a way to study the composition of the outer zone at its closest approach to earth. It has been generally thought that this zone is populated by the active sun because the flux in the outer zone can be associated with solar activity. Scientists cannot be certain that this is the only mechanism; and the only way to test other possibilities is by high latitude studies. Experiments to investigate why some solar particles arrive directly and some get trapped and arrive after some delay can readily be done at Fort Churchill.

#### METEOROLOGY

Rocket firings in or near Arctic latitudes in order to investigate theories of fore-

casting arctic tropopause phenomena are much used in the field of meteorology. Because of a dearth of meteorological data, up to even 100,000 feet, these theories are largely untested. In order to allow some degree of verification or rejection of theory, it will be necessary to examine events and collect data. An experimental station near the Arctic that furnishes a base from which snow cover photography can be performed is generally considered an important addition to the meteorological program. While there are several other locations which would suffice, Fort Churchill is a good location.

#### BALLOON-BORNE EXPERIMENTS

Balloon-borne experiments do not use a rocket launch facility per se but do need the auxiliary services of such a facility and are complimentary, in some degree, to rocket borne experiments. The duration of such experiments is generally much longer than for rocket experiments (as much as 10 to 12 hours) and they are conducted at much lower altitudes (maximum altitude about 135,000 feet). The principal virtue of this vehicle, of course, is that it permits a time-course analysis of one or more parameters. In these experiments the detector is one of two types: emulsions, with which a recovery capability is needed, or counters, with which telemetering capability is needed. While some of the experiments are concerned with very high energy measurements, others investigate the same low energy particles as do the rocket experiments. High energy studies generally are not latitude sensitive and many times are done at lower latitudes at less isolated installations. There are occasions, however, where the two types of experiments need be done at the same locale, and the lower energy experiments cannot be done at lower latitude. Among those studies that must be done at high latitude and altitude are low energy spectrum studies (counter), low energy heavy primary composition (emulsion), low energy electron and positron flux (counter), composition of the primary cosmic radiation (emulsion),

time course of X-rays associated with solar flares (counter), and the isotopic ratio of helium ( $\text{He}^3/\text{He}^4$ ) (emulsion).

Even from this cursory treatment of the subject it can clearly be seen that there are many geophysical experiments that can only be performed at rocket altitudes in the auroral zone. Along with these are those associated experiments that can be performed at balloon altitudes. And then there is a still larger class that can possibly be done elsewhere, but would provide more complete information if performed in the auroral zone. Although not all of the experi-

ments performed at Fort Churchill have an immediate or obvious application to Air Force needs, a surprising number do. Without a doubt there is a need within the Air Force for a statistically valid store of high altitude, high latitude geophysical and meteorological data. This data is invaluable in the fields of vehicle design and in the effectiveness evaluation of weapons systems. On that basis there is not merely a need, but a high priority need, for a research rocket facility in the auroral zone. And Fort Churchill is perhaps the best location available for such a facility.

### EARLY HISTORY<sup>1</sup>

Although the story of the Churchill area as a rocket range is still so recent that it really is a matter of current affairs rather than history, the story of the Churchill area proper goes back to a much earlier period of North American history—to the early 17th century and its hardy European explorers.

Henry Hudson first brought Europeans in reach of the Churchill area in August of 1610 when he discovered the bay that today bears his name; but it remained for the Danes to be the first to attempt settlement. In 1619 Jens Munk was commissioned by King Christian IV of Denmark to seek a northwest passage to India. The expedition left Copenhagen in May of that same year with two ships carrying a total of sixty-five men. They were delayed for a time by ice in Hudson Strait, but finally on 7 September 1619, nine years after Henry Hudson had discovered Hudson Bay, Jens Munk sailed into what is now Churchill harbor.

After exploring the area around the harbor, Munk decided to spend the winter at Churchill. Stormy weather and increasing cold helped him to make this decision, but as events turned out he might have been wiser to chance the stormy seas. He brought his two ships four and a half miles up the Churchill River from the harbor entrance and there he and his crew prepared their winter quarters. Although the winter that year was not especially severe by Churchill standards, the intense cold and blinding snow storms were more extreme than anything the Danes were prepared to encounter. By January 1620 every member of the expedition was suffering from scurvy. Only Jens Munk and two of his seamen were still alive in June 1620 when the ice broke up. These three managed to sail the smaller of their two ships out of Churchill

harbor on 16 July 1620, finally arriving back in Denmark on 21 September 1620. (The Pilgrims had set sail from England on 16 September 1620 enroute to the New World. One cannot help but wonder what effect Jens Munk's story of the winter of 1619-20 might have had on the Pilgrims colonization plans had their paths crossed on the Atlantic.) Munk named the country around Churchill "New Denmark" and Churchill harbor itself "Jens Munk's Winter Haven."

Apparently Jens Munk's explorations did not generate much enthusiasm among his fellow countrymen, for there is no record of further Danish visits to the Churchill area. In fact it was not until eleven years later, in 1631, that Europeans visited the western side of Hudson Bay again. In that year two expeditions (both English) arrived in the Churchill area, one under a Captain Fox in the "CHARLES" from London and another under a Captain James in the "HENRIETTA MARIE" from Bristol. It appears that neither of these expeditions entered the Churchill River.

Following those expeditions the Churchill area lay dormant until the latter part of the 17th Century. In 1670 the Hudson's Bay Company was incorporated under a charter from King Charles II. The company was granted the sole right of trade and commerce in the area then known as Rupert's Land, which included all of the area surrounding Hudson Bay.

It was under the Hudson's Bay Company that the name Churchill first was applied to the region. Captain John Abraham, Deputy Governor of the Hudson's Bay Company, sailed northward from Fort Nelson in 1686 in the sloop "HAYES" and explored the Churchill River. Captain Abraham named the river "Churchill" in honor of Lord John

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<sup>1</sup> *Fort Churchill Manitoba*, undated publication by Canadian Army, Ft. Churchill, Manitoba.

Churchill, afterwards famous in history as the first Duke of Marlborough, who had been elected Governor of the Company in 1685. Captain Abraham returned to England to report to the Company's Committee on his findings at Churchill Harbor. As a result of his report the Company decided to build a post at the site of Churchill Harbor.

Construction of the Company post, to be located on the west bank of the Churchill River, was begun in the summer of 1689. Misfortune again hovered over the area, however. Around the first of August 1689, when considerable progress on the new post had been made, a fire destroyed the building and most of the stores. It was decided to abandon the project, so the remaining stores were loaded aboard ship and for another 28 years no attempts were made to settle Churchill. Then, in 1717, James Knight, the first Governor-in-Chief on the bay, established a new post on the site of that which was destroyed by fire in 1689.

Although the Danes never returned, the French became very active in the early settlement of Canada. Indeed, by 1731, the French were threatening English control of Hudson Bay. The Hudson's Bay Company became concerned over this threat and instructed the Governor of Churchill to construct a fort which would command the harbor entrance. He selected the promontory at the entrance of the harbor, known as Eskimo Point, as the location for the fort.<sup>2</sup> Actual construction began in 1733 but was not completed until thirty-eight years later in 1771. It was named "Fort Prince of Wales" and, though massive in design, it proved to be a complete failure as a defense against attack. The French had been driven out of Canada by the time the fort was completed, but they returned during the period of the American Revolution. As a part of the French naval force aiding the American colonists, three French ships under the command of Admiral Jean-Francois de la Perouse besieged the fort in 1782. The fort was commanded by Samuel Hearne, who,

having a force of only 39 men, had no alternative but to surrender when faced with Admiral de la Perouse's force of 400 men and the superior firepower of the guns from three naval vessels. De la Perouse sacked the fort, spiked and dismounted the guns, burned the buildings, and took Hearne and his garrison with him as prisoners of war when he sailed.

Although later ransomed by the Hudson's Bay Company and returned to Churchill in 1784, Hearne was never able to re-establish the importance of Churchill. The factory was re-established at the site of the post built by James Knight in 1717, but with the destruction of Fort Prince of Wales the Churchill post lost much of its importance. Later the York Factory, located farther south along the western shore of Hudson Bay, became the main seat of trade in the area.

Churchill continued as a minor Hudson's Bay Company post, and on many occasions as a base for travelers, scientists and explorers, but it was not until 1926, one hundred and forty-four years later, that it was once again selected to play an important role in the development of Canada. In that year it was decided that Churchill would be the terminus of the new Hudson Bay railroad which extended northward from The Pas, Manitoba. Port Nelson had been selected earlier as the terminus, but because of difficulties encountered in the completion of harbor facilities at that site, a Royal Commission recommended that Churchill be chosen instead. The railroad reached Churchill in 1931, with regular train service beginning in September of that year.

The present day military post of Fort Churchill is located on the northwestern shore of Hudson Bay, slightly north of the 58th parallel, in Canada's subarctic region. It is on the mouth of the Churchill River, approximately 600 miles north of Winnipeg, Manitoba. The town of Churchill, containing about 2500 inhabitants and the only other inhabited area within 100 miles, is five miles by road from Fort Churchill. The town of Churchill is Manitoba's seaport, from which prairie grain is shipped to western Europe, as well as a main supply point for the central and eastern Arctic regions.

<sup>2</sup> This should not be confused with the Eskimo Point, about 170 miles north of the base camp, where one of CRR's instrumentation sites is located.

Fort Churchill is situated on a flat, water-logged plain, averaging less than 25 feet elevation above sea level, although in a few areas along the shores of Hudson Bay ridges of rock rise to over 100 feet. Bordering the mouth of the Churchill River and Hudson Bay is a broad belt of sloping land which is flooded at high tide and reverts to rocky mud flats at low tide. The rocky bottom and shores are an ever present hazard to small boat operations. The terrain has an extremely monotonous appearance during winter months, when the many small bodies of water are frozen and snow covers the ground. At that time, the absence of prominent landmarks, combined with generally poor visibility and short periods of daylight, make land travel by foot or vehicle extremely hazardous.

Winter temperatures of 30 degrees below zero are common in this area, and temperatures may range as low as 50 degrees below zero. Wind velocities range to 50 MPH, and it is characteristic of the region that the wind is usually blowing. Snow storms occur quite often, and during a storm, visibility may be reduced to a matter of a few feet. Under such conditions, movement is extremely hazardous, and military groups in the field who encounter these conditions are required to halt, report their last known or approximate position (all vehicles are equipped with two-way radios), and await a search and rescue team.

The "windchill" factor makes the winter even more hazardous and severe than the temperatures themselves would indicate. Common experience shows that, when temperatures are low, it feels much colder if there is a wind than if it is calm. Temperature alone, therefore, does not give a true indication of the relative comfort of outdoor activities. Some scale has to be used based on both temperature and wind. The one used is the so-called "windchill scale." It was originated by Dr. Paul A. Siple, the well-known Antarctic explorer.

Human comfort depends on the rate at which heat is lost from the human body. The windchill factor caused by any combination of wind and cold was, therefore, defined as the number of calories that would be lost under these conditions during one hour from

a square meter of a surface kept at 91.4° F., which was used to represent skin temperature. For example, a temperature of 20° F. with a wind of 40 miles per hour has the same cooling effect as -20° F. with a 5 mile per hour wind. Both would result in a loss of about 1400 calories in an hour and both are therefore said to have a windchill factor of about 1400 (exposed flesh freezes; travel and life in temporary shelters become disagreeable). In comparison, a windchill factor of 100 allows sunbathing. At Fort Churchill, where temperatures of below -30° F. can be accompanied by strong winds, the windchill factor can easily be above 2000 (exposed areas of face freeze in one minute; travel and life in temporary shelters become dangerous) and as high as 2500 (exposed areas of face freeze within one-half minute).

In the summer, the mean temperature is in the range of 50 to 60 degrees, with frost at night not uncommon. It is never completely dark, there being a period of twilight for a few hours in the middle of the night. There is relatively little rainfall in the summer. Practically all precipitation comes as snow in the fall, winter and especially the spring. The ice breaks up and the snow disappears in June, although the last snow storm of the year may also occur in June. Shipping is generally confined to the period July through September. By October, ice is again forming, and by 20 November the permanent freeze has set in. Characteristic of the short summer is the prevalence of swarms of insects such as gnats, mosquitoes and black flies.

The military camp at Fort Churchill and the adjacent landing field were originally established by the United States Government in 1942 as part of an air route, from the United Kingdom to the United States, to be used in the evacuation of casualties from the allied invasion of France. The number of casualties was not as high as anticipated and medical facilities in England proved adequate, so Churchill was not needed as an evacuation point. In 1944 the camp was taken over by the Canadian Government and until October 1946 was controlled by the Department of Transport. The primary use of the camp in 1945 and 1946 was as a base for

Arctic exercises and equipment trials conducted by the Canadian Army.

On October 10, 1946, the camp was taken over by the Canadian Army for use as an experimental and training station. It was subsequently named Fort Churchill, to distinguish it from the town of Churchill and to indicate its military nature. In 1947 the first Arctic Test Detachment was established there by the U.S. Army Engineers.

In 1954, three years before the Soviet Union's first Sputnik began circling the earth, the Arctic skies above Fort Churchill were being pierced with various types of rockets. The Canadian Army was in charge of these first series of rocket firings. After a short period of inactivity, along came the IGY. A joint Canadian and American scientific group selected Fort Churchill, because of its relative accessibility and its nearly ideal location for many types of experiments, as the ideal location for conducting rocket experiments in the upper atmosphere during the period of the IGY. (See Chapter I)

Construction of the basic framework of the present range began in 1956 and was completed in 1957. The launch facilities and some of the peripheral instrumentation sites were built during that period, the whole operation, of course, being in support of the IGY effort. Rocket firings in support of that program started in July 1957 and continued until December 1958. During the 18-month period of the IGY almost 200 rockets of the Aerobee and Nike Cajun class were fired. The range was again closed in December 1958, with the conclusion of the IGY program.

The period of closing was of short duration, however. Evaluation of the very successful IGY rocket firing program at Fort Churchill clearly indicated that the results obtained were extremely beneficial to the upper atmosphere research programs of both the United States and Canada. Scientific groups from both countries pressed for action to reopen the range for the continuance of upper atmosphere research in the

Arctic. After carefully studying the problem, the governments of the United States and Canada finally determined that operation of the Rocket Research Facility (RRF) at Fort Churchill, Canada, should be continued. The range reopened in August 1959 and again was under the operational control of the United States Army.

The Chief, Research and Development, Department of the Army, assigned the responsibility for maintenance, operation and management to the Chief of Ordnance, who on 15 August 1959, assigned the responsibility to command, manage and operate the RRF at Fort Churchill to the Army Ordnance Missile Command. That command in turn redelegated responsibility to the White Sands Missile Range on 24 August; and the White Sands Missile Range assigned the operation of the RRF to its Integrated Range Mission (IRM). The Military District of Washington (MDW) provided the logistic and administrative support.

The primary intent of all this redelegation of responsibility was to insure the continuance, on a long-term basis, of the operation of the facility at Fort Churchill for rocket exploration of the upper atmosphere and to provide rocket and missile range services for all authorized users after completion of the IGY rocket program. This included the National Aeronautics and Space Administration (NASA), the U.S. Air Force, the Advanced Research Projects Agency (ARPA), the U.S. Navy, the Continental Army Command, the U.S. Army Signal Corps and the Canadian Army. This program was initially launched on 5 September 1959, with the successful firing of two rockets.<sup>3</sup> From that date until the disastrous fire in February 1961 the Churchill rocket complex was a going concern under the management of the U.S. Army. The U.S. Air Force entered the picture at that time only as one of the range users.

<sup>3</sup> *History of White Sands Missile Range, 1 Jan-31 Dec 1959, Vol. I, pp. 1-4.*

## ACQUISITION OF THE CHURCHILL RESEARCH RANGE PRELIMINARY NEGOTIATIONS

Those events which culminated in the transfer of operational responsibility of the Rocket Research Facility (RRF) at Fort Churchill, Manitoba, Canada, from the Army to the Air Force's Office of Aerospace Research, on 1 July 1962, had their beginnings as far back as 1 January 1961. On that date the U.S. Army acquired Ladd Air Force Base, Alaska (subsequently renamed Fort Wainwright). On 1 April 1961 the U.S. Army Arctic Test Center (USAATC) was moved from Fort Churchill to Fort Wainwright where it was established as the U.S. Army Ordnance Arctic Test Activity (USAOATA). In June 1961, the Military District of Washington (MDW) withdrew the logistic and administrative support it had been providing the RRF at Fort Churchill since July 1959; and the White Sands Missile Range (WSMR), which participated in the Phase Out Plan for the USAATC, assumed the support activities formerly provided by the MDW.

Subsequent to the acquisition of Ladd Air Force Base, but prior to the assumption of support activities by WSMR, further complications arose when a fire of undetermined origin destroyed much of the launch area of the RRF on 28 February 1961.<sup>1</sup> Property damage was estimated at

<sup>1</sup> The fire was discovered about 3 AM in the building housing the diesel generator plant. The plant attendant attempted to phone for help but the fire had already damaged the phone wires so that he could not get a call through.

The attendant rushed to a snow-blower and drove the vehicle two miles in 35° below zero weather to the nearest telephone to summon help from Fort Churchill. By the time the firefighters and their equipment arrived, the rocket facility was almost a complete loss. The generator building, helium storage, diesel storage, helium compressor building, Aerobee assembly and preparation building, mess hall, launch control building, and a portion of the tunnel connecting the launch control building and the Aerobee tower were all destroyed. Only the boiler

one million dollars for facilities and \$750 thousand for instrumentation. The Chief of Ordnance instructed the Commanding General of WSMR to develop a plan to restore the capability to launch rockets at the RRF. On 17 March 1961, a "Plan for Re-establishment of Launch Capabilities at Rocket Research Facility" was forwarded through the Commanding General of the Army Ordnance Missile Command (AOMC) to the Chief of Ordnance. That plan did not provide for full restoration of the RRF to its original capability, but only for temporary rehabilitation and modification of the existing RRF and restoration of damaged equipment which would provide limited launch facilities for specific types of vehicles. An expenditure of \$650 thousand was the estimate for a partial restoration of the launch facility. At best this plan represented an adequate, though austere, proposal for restoration.

At the time he forwarded this restoration plan to the Chief of Ordnance, Major General J. A. Barclay, Deputy Commander of the Army Ordnance Missile Command, reiterated a previous request that the Ordnance Corps be relieved of the responsibility of operating and maintaining the RRF. General Barclay recommended that the destruction of most of the facility by fire "be used as an instrument whereby the mission can be discontinued."<sup>2</sup> He felt the funds could be

plant, Aerobee launch tower and the Nike-Cajun facilities (including assembly buildings, launch area and tunnels) were undamaged.

The irony of the incident was that if the plant attendant had known how to operate the snow-blower as well as drive it, he could probably have blown snow on the fire and put it out.

<sup>2</sup> 1st Ind., Ltr., CG, WSMR, to CG, AOMC, subj.: "Plan for Reestablishment of Launch Capabilities at Rocket Research Facility," 17 March 61. (See pp. 14-16, *Hist of WSMR, 1 Jan 61-30 Jun 61, Vol II.*)



better utilized at the Army's new cold weather testing station at Fort Wainwright, Alaska. If the RRF was to be re-established, he suggested that the prime users of the facility underwrite the cost of its re-establishment, although he personally recommended that it not be re-established.

On 5 April 1961, the Chief of Ordnance notified the Commanding General, WSMR, that the DDR&E had not given favorable consideration to the Ordnance request to be relieved of the RRF. (The Ordnance Corps had been seeking a means whereby it could turn the RRF over to another arm or service even before the acquisition of Fort Wainwright.) However, Dr. Harold Brown, DDR&E, decided, after giving considerable thought to the matter, that since the Army had no further requirement for the type of experiments conducted at the RRF, it would be more appropriate to transfer the management of it to one of the agencies having a more significant interest in the facility. He suggested the beginning of FY 1963 (1 July 1962) as the target date for the transfer of the management responsibilities, exploring, at the same time, the possibility of either NASA or Canadian management of the range.<sup>3</sup>

Meanwhile, so that the RRF could successfully fulfill its responsibilities, the Department of Defense (DOD) announced the organization of the U.S. Army Ordnance Rocket Research Facility (effective 15 May 1961). Responsibility for the command and management of the new RRF was assigned to the Chief of the WSMR's Integrated Range Mission (IRM). The new organization's mission was to maintain and operate the U.S. Army Ordnance Rocket Research Facility at Fort Churchill, Manitoba, Canada, for the use of various agencies engaged in rocket exploration of the upper atmosphere as determined by the joint Canadian/U.S. Operational Coordinating Group (OCG).<sup>4</sup>

Concurrently, an Army plan for an entirely new facility to be located at a new site at Fort Churchill was forwarded to the

Canadian Government and was approved by the Canadian Minister of National Defence in June 1961.<sup>5</sup> The relocation and reconstruction of the RRF was to be completed by November 1962 -- subject, of course, to the provisions that the facility be reconstructed at no cost to Canada; that the layout, contracting and construction details be in accordance with inter-governmental agreement; and that the U.S. personnel ceiling of 500 not be increased. The Canadian Government was willing, however, to furnish \$80 thousand for instrumentation and increased administrative support.

In June 1961, two groups visited the RRF in an effort to complete plans for construction of the new launch site. One group, composed of representatives of IRM's Technical Operations Branch and of the Corps of Engineers, came up in an effort to determine criteria for the launch facility design contract negotiations. Later another IRM group inspected the progress of the construction work. Because of wind turbulence at the launch site, the latter group requested the U.S. Army Corps of Engineers, Eastern Ocean District, to submit three alternate plans, showing different arrangements of the buildings within the complex. The District Engineer submitted the three plans in July 1961, each progressively more costly, and all of them in excess of the plan then being implemented. After carefully considering each plan, Technical Operations, IRM, determined that wind turbulence at the launch site, while considerable, would not be of sufficient severity to influence site selection and requested the District Engineer to continue work using the original plan.<sup>6</sup>

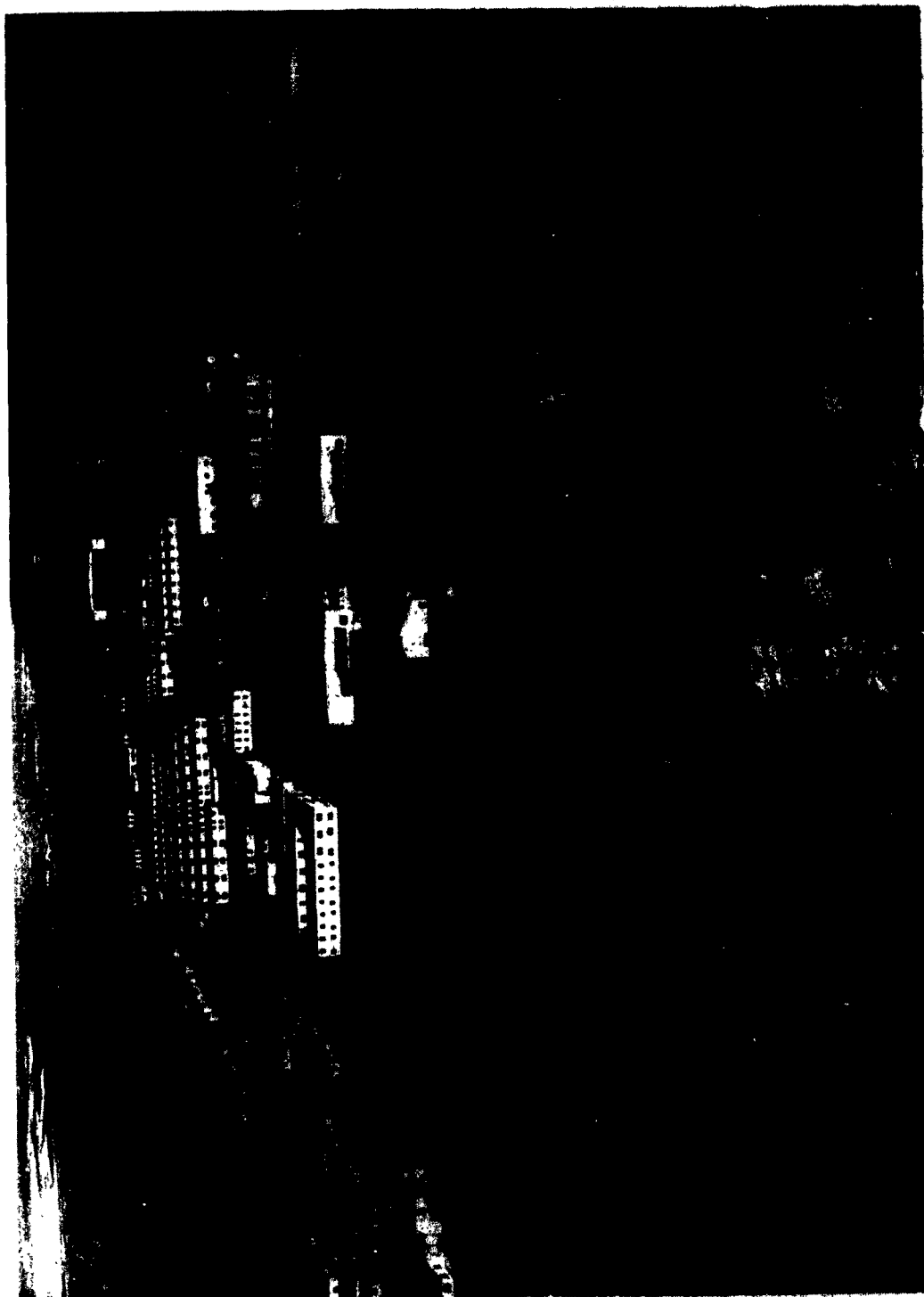
It was around this same period that the U.S. Air Force, along with the U.S. Army and NASA, became a leading contender for the position of range manager at Fort Churchill. With the U.S. Army signifying it no longer needed the Churchill facilities and the Canadian government apparently preferring military management of the range, the odds in favor of the Air

<sup>3</sup> *Hist of WSMR, 1 Jan. 1961-30 June 1961, Vol. I, p. 12-13.*

<sup>4</sup> Ltr., Hq. DA (TAGO) to Chief of Ordnance, subj.: "Organization of the U.S. Army Ordnance Rocket Research Facility," 22 May 61. (See p. 12, Vol II, *Hist of WSMR, 1 Jan 61-30 Jun 61.*

<sup>5</sup> *Hist of WSMR, 1 Jan. 1961-30 June 1961, Vol. I, pp. 10-13.*

<sup>6</sup> *Hist of WSMR, 1 Jan. 1961-30 June 1961, Vol. I, pp. 15-16.*



Air View of Fort Churchill, Manitoba, Canada  
(CRR Headquarters located in building immediately below water tower)

Force being selected were exceptionally good.

As early as October 1960, the DDR&E asked the Army to re-evaluate the activities and requirements of the RRF. All agencies contacted during the course of the re-evaluation, including NASA and the Air Force, advised that, although launch facilities were available at United States locations, none of the locations possessed the unique geophysical characteristics found in the Churchill area. It was concluded, therefore, that there were cogent scientific considerations which required the continuation of U.S. rocket research activities at Fort Churchill.

As a result of that re-evaluation, in December 1960, the Assistant Secretary of the Army (R&D) recommended, that, even though NASA was the dominate user of the range, responsibility for operation and maintenance of the RRF should be transferred to the U.S. Air Force. He based that recommendation on: (1) the cost to NASA would be excessive as it would have to operate the range either exclusively on a contract basis or with the aid of a military detachment; (2) the Air Force was the dominant Defense Department user of the range; (3) the Air Force already had many units and considerable numbers of personnel dispersed throughout Canada as part of NORAD; and (4) the Strategic Air Command had a refueling base nearby, so coordination of air space over the range could more readily be accomplished if the range manager was also an Air Force unit.<sup>7</sup>

In March 1961, still pressing for a solution to the range management problem, the Assistant Secretary of the Army (R&D) recommended that the operation of the Churchill range and the custody of the remaining facilities be turned over to the U.S. Air Force or to NASA, whichever had the primary interest and capability to restore the facilities for continued operations.<sup>8</sup> If neither agency was interested in continuing upper atmosphere probes from Fort Churchill, Army representatives

recommended that the facilities be turned over to the Canadian Government under the terms of the inter-Governmental agreement. (See Appendix A)

On 12 June 1961, the DDR&E requested the U.S. Army and the U.S. Air Force to jointly prepare a study for presentation to the Research and Engineering Policy Council's 3 July 1961 meeting to determine if the Department of Defense should operate the RRF and, if so, which of the military departments should manage the facility. If the study concluded that the Department of Defense should not operate the facility, then the study was to be expanded to show the Department of Defense position vis-a-vis the known NASA position and to suggest a recommended basis for operation by NASA. The desires of the Canadian Army and the Canadian Government, if known, were to be taken into consideration. Since the Army was then operating the RRF, it seemed appropriate that it assume responsibility for the preparation and presentation of the study. In the meantime the DDR&E authorized the Army to proceed with that portion of the construction at the RRF which could be accomplished with the funds then available, or to be made available during FY 1962.<sup>9</sup>

In response to the DDR&E request the Assistant Deputy Chief of Staff, Research & Technology, USAF, informed the Army in July 1961 that the Air Force would have a continuing requirement for research rocket operations at Fort Churchill and believed it was in the national interest to restore that facility to operation. He reminded the Army, however, that there had been no Air Force money budgeted for any phase of that operation, and that there was no Air Force plan at that time to assume management of the facility. He indicated that the Air Force planned to initiate an independent study (to be done by OAR) to determine, in detail, the feasibility of assuming the operation of the facility if it were assigned to USAF. If the study showed it would be practical for the Air Force to assume management and operation of the RRF, then

<sup>7</sup> Memo, ASA, Dir. of R&D to DDR&E (RSGS), subj.: "Operations at Fort Churchill," 7 Dec 1960.

<sup>8</sup> Memo, ASA (R&D) to DDR&E (RSGS), Subject: "Operations at Fort Churchill, Canada," 20 March 61.

<sup>9</sup> Memo, DDR&E to Asst. Secy. of Army (R&D) and Asst. Secy. of Air Force (R&D), subj.: "Operations of the Rocket Research Facility at Fort Churchill, Canada," 12 June 1961.

a proposed plan and schedule of requirements would be submitted to the DDR&E. The Air Force did not feel it would be in a position to even consider the possibility of NASA assuming the operation of the facility until after the aforementioned study was completed around 15 October 1961. By that time the Air Force promised to hand down a decision on the plan of action it preferred.<sup>10</sup>

In the meantime, the Army presented its briefing paper to the Research and Engineering Policy Council of the DDR&E on 17 July 1961 (the 3 July meeting being postponed until 17 July). The United States operation of the RRF was described as not military but scientific in nature, the military personnel being mostly engaged in planning, administrative and logistic functions. Inasmuch as NASA was the major user of the RRF, the Army recommended that the installation be reconstructed and transferred to NASA on 1 July 1962; if NASA did not want to accept management of the facility, it should be transferred to the U.S. Air Force. The Army particularly emphasized that it had no further requirement for a launch facility, other than to use some of the instrumentation in connection with small meteorological probes to be launched by the Signal Corps, and that it had already requested relief from the management responsibility of the range.<sup>11</sup>

After considering the replies of the two services, the Chairman of the Operations Coordinating Group for Churchill recommended that the DOD decision on management of the RRF be deferred until the Air Force completed its independent study. At the same time he urged that the Air Force complete its study in less than the proposed ninety days, for, if the Air Force recommended NASA management, a lengthy series of negotiations might be necessary, which would greatly delay getting the range back into efficient operation.<sup>12</sup> Because of

NASA's significant interest in the RRF (and despite earlier statements to the contrary), the Air Force study was to include consideration of the NASA position. It was assumed that NASA would support the RRF operation under either the DOD or its own administration, even though NASA was the dominant user.<sup>13</sup> If NASA assumed operational responsibility for the RRF, however, it would mean operation on a contract basis.

While the official desires of the Canadian Army and the Canadian Government concerning range management were not yet known, contacts with various Canadian representatives associated with the Joint Board on Defence and other Canadian agencies indicated that the Canadian Defence Research Board (DRB) was primarily interested in the restoration of the facility and its continued operation by the United States, regardless of which service might be the range manager. Canadian representatives re-affirmed Canada's own inability to finance and operate the facility at the levels of activity that would be expected by the present users.<sup>14</sup>

Meanwhile, on 24 July 1961, Headquarters USAF requested OAR to prepare the independent study previously discussed, in the form of an evaluation of the advantages of continued operation of the range at Fort Churchill as compared to the establishment of similar facilities at Thule, Greenland or at some location in Alaska. OAR was to conduct the study on the assumption that the Air Force would be assigned the responsibility for operation of the RRF, with special emphasis on NASA's requirements, potential Army and Navy requirements, Canadian-US agreements (indicating those which might require modification), cooperative arrangements to be effected between OAR and the SAC units stationed at Churchill and, of course, cost factors. In addition to furnishing recommendations as to a proper

<sup>10</sup> Ltr., Hq USAF to Chief, R&D, U.S. Army, subj.: "Operations of the Rocket Research Facility at Fort Churchill, Canada," 14 July 1961.

<sup>11</sup> Army Briefing Paper to the R&E Policy Council, DDR&E, 17 July 1961.

<sup>12</sup> Briefing by Lt. Col. M. S. Johnston, Management Div, OCRD, on "Future Management and Operation of the Upper Atmosphere Research Facility at Fort Churchill," 17 July 1961.

<sup>13</sup> Estimated 35% utilization of the RRF against 30% for the USAF and 35% for the DRB (Canadian) during the first year of resumed operations with an estimated continuing requirement of 40% against 35% for the USAF and 25% for the DRB.

<sup>14</sup> Briefing by Lt. Col. M. S. Johnston, Management Div, OCRD, on "Future Management and Operation of the Upper Atmosphere Research Facility at Fort Churchill," 17 July 1961.

location for a research rocket range, OAR was expected to indicate the extent to which OAR itself would participate in the operational responsibilities of the range. Headquarters USAF requested a reply by 30 September 1961.<sup>15</sup>

On 10 August 1961, OAR created a special Task Group, headed by Col. John R. Fowler, Deputy Director of Plans, DCS/Plans & Operations, to prepare the desired evaluation. Lt. Col. Claude R. Kimbrel and other members of the OAR staff assisted him. Small working groups were assigned to examine the various areas involved (Canadian-US agreements, OAR-SAC arrangements, proposed rocket firing workload, etc.).<sup>16</sup>

In presenting their conclusions to Hq USAF on 19 September, after several weeks of discussions and planning, the OAR representatives acknowledged that the Air Force had continuing requirements for the use of the RRF at Fort Churchill and that it was in the national interest to restore the facility to operation. It was further pointed out that many Air Force experiments using rockets could only be performed in the maximum auroral zone. Of the three locations suggested, (Churchill, Greenland or Alaska) Churchill appeared by far the best.

Assuming that the Air Force rather than NASA would be assigned the responsibility for operating the RRF, that the U.S. Army would provide the resources necessary for the reconstruction and rehabilitation of the RRF during FY 62, that a new joint agreement extending support services could be negotiated with the Canadians, and that the SAC unit already there could provide needed administrative services, the OAR Task Group arrived at the following conclusions:

- (a) The RRF should be modernized to satisfy user requirements;
- (b) It should be assigned to an already established USAF range;
- (c) Contractor operation would be most suitable;

<sup>15</sup> Ltr., Dept. of the Air Force (Hq USAF) to OAR, subj.: "Fort Churchill," 24 July 1961.

<sup>16</sup> Memo, Hq OAR to Attendees, subj.: "Notes of First Meeting of OAR Task Group to Consider Fort Churchill, Canada, Rocket Research Facility," 18 August 1961.

- (d) New agreements with the Canadians were necessary;
- (e) Administrative services should be furnished by SAC;
- (f) Annual operation costs would run about \$3 million; and
- (g) The management office at the RRF would require about 15 people.

At the time, the Task Group recommended the appropriate actions be taken to put the above conclusions into effect.<sup>17</sup> Later, Hq USAF modified the last two points, calling for annual operation costs of \$4 million and recommending a minimum of 20 people for the management office of the RRF.

On 2 October 1961, taking into account the OAR report of 19 September 1961 on Churchill and other studies on the same subject, the DOD's Assistant Director, Ranges and Space Ground Support (RSGS), submitted what he termed a definitive report concerning the disposition of the RRF. Among other things the report stated that the Canadian Commander at Fort Churchill expressed a preference for military control of the U.S. operation at Churchill. The report went on to say that all operational functions now performed by the military could just as easily be assumed by contractor personnel. It recommended, however, that the functions of command, planning and supervision of launches be retained by personnel of the U.S. Government agency which was assigned the management responsibility of the RRF. The report also stated that informal conversations with NASA revealed that agency's strong disinclination to assume responsibility for the range. NASA did indicate, however, a willingness to pay its pro rata share of the total cost of the operation.<sup>18</sup>

The report declared, further, that the USAF was capable of operating the RRF as

<sup>17</sup> *Ibid.*

<sup>18</sup> Recommendations from the Asst. Dir., Range & Space Ground Support, to the R&D Policy Council, DDR&E for Management of the RRF, Fort Churchill, Canada, 2 Oct. 1961.

Although the Canadian Government had not been approached formally or informally at this time, there was every indication that all the Canadian officials involved were aware of the pending decisions to change management and showed no interest in the matter beyond their desire that the United States continue to operate the facility.

well as supporting the installation logistically, with a slight augmentation of the SAC squadron located at Churchill. Sufficient funds should be provided, it declared, to permit a predominantly contractor operation under the control of the Air Force.

Based on manpower and skills available and capability for logistic support, the report concluded that the USAF was better able to operate and manage the RRF than either NASA or the Canadian Government. The report also expressed a strong feeling that U.S.-Canadian relationships at Fort Churchill would be smoother under Air Force management of the facility than under NASA management. The final recommendations, therefore, were:

- (1) that the Army be relieved of the responsibility of operation of the RRF by the Air Force, preferably on 1 July 1962;
- (2) that the USAF and the Army determine immediately whether there should be any modification or revision of the approved construction plan;
- (3) that NASA confirm its pro rata share of the operation costs of the RRF; and
- (4) that the USAF RDT&E budget be increased by the amount necessary for this additional mission (about \$2.75 million it was estimated).<sup>19</sup>

These recommendations were accepted by the DDR&E, and on 12 October 1961 the Army was directed to transfer to the Air Force, all that property and equipment at Churchill which was used for the operation and maintenance of the RRF. The Army was also directed to complete the construction and restoration of the range. The transfer of responsibility was to be completed, with the exception of the construction, by 1 July 1962. The Air Force was reminded that it must submit a request for the necessary increase in its FY 63 RDT&E budget for the performance of the additional mission.<sup>20</sup>

On 15 October 1961, the Department of the Army formally notified the Canadian

Army of the decision voiced by the U.S. Department of Defense, and requested concurrence by the appropriate agencies of the Canadian Government. The Canadians were assured that in the interim there would be no reduction in the equipment at the RRF, and that the U.S. Army would supervise the completion of the construction at the new site. The Canadians concurred in the proposed transfer.

The Army Ordnance Missile Command (AOMC) requested WSMR to initiate plans immediately for the transfer. The Plans and Operations Office, WSMR, in compliance with a directive from the Department of Defense, requested that no action be taken by the WSMR Personnel Office with respect to RRF personnel, except as an integral part of the transfer plans, since Army curtailment of personnel might jeopardize RRF activity.<sup>21</sup>

On 25 October 1961, the Office of the Chief of Staff, USAF, taking into consideration the OAR recommendation that the RRF be assigned to an already established USAF range, nevertheless decided against the recommendation and notified OAR that it was assigned responsibility for the management and operation of the Churchill range. The reason given was that OAR was both the "principal USAF user of the RRF and responsible for the rocket and satellite research services program."<sup>22</sup> OAR's 19 September 1961 plan for the management of the RRF was "approved in principle," with the following actions required:

- a. It is requested that a detailed and specific plan for the assumption of responsibility and operation of the RRF be submitted to this headquarters by 15 December 1961. In developing this plan OAR will contact NASA relative to test programming and reimbursement to the USAF for test support and operations for NASA at the RRF.

<sup>19</sup> *Ibid.*

<sup>20</sup> Memo, DDR&E (John H. Rudel for Harold Brown) to Asst. Secy. of Army and Air Force (R&D) and Chairman, OCG, subj.: "Management and Operation of the Rocket Research Facility, Fort Churchill, Canada," 12 October 1961.

<sup>21</sup> *Hist of the WSMR, Vol. I, 1 Jan.-30 June 1962*, p. 30.

<sup>22</sup> Ltr., Dept. of the Air Force (Off/Ch of Staff) to OAR, subj.: "Management and Operation of the Fort Churchill Rocket Research Facility," 25 October 1961.

b. It is requested that OAR immediately establish working relations with the Programs Management Branch, Research and Development Division, Office of the Chief of Ordnance, Department of the Army for development of preparations for taking over the Fort Churchill RRF facilities and operations from the U.S. Army on or about 1 July 1962.<sup>23</sup>

OAR was informed that the USAF FY 63 RDT&E budget would be increased by \$2.75 million (this amount to be allocated from 690 funds) for the contractor operation of the RRF, with NASA paying its pro rata share (estimated at \$1.25 million. The Department of the Air Force promised

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<sup>23</sup> *Ibid.*

"expeditious action" on requested manpower spaces for the new installation.

There was some discussion in early November 1961 as to whether it might be preferable to assign the RRF to the Air Force Cambridge Research Laboratories (AFCRL) rather than directly to Hq OAR.<sup>24</sup> After examining the matter carefully and weighing the arguments for and against each case, Hq, USAF assigned the Rocket Research Facility to OAR, and Hq, OAR made no further move to delegate the management responsibility to AFCRL.

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<sup>24</sup> Memo, Col. J.W. Streeton (OAR) to Col. Fowler (OAR), Subj.: "Random thoughts in favor of assignment to AFCRL," 7 November 1961; Ltr., Hq OAR (RRK) to OAR (RRON-Col. J. R. Fowler) Subject: "Management of Rocket Research Facility at Fort Churchill, Canada," 7 November 1961; Ltr., Hq OAR, RRPM to RROS, Subj.: "Operation of Fort Churchill," 7 November 1961.

## ACQUISITION OF THE CHURCHILL RESEARCH RANGE: CONCLUDING ARRANGEMENTS

The detailed plan for the assumption of responsibility and operation of the RRF by OAR, as called for in the Department of the Air Force letter of 25 October 1961, was submitted to that office by Hq. OAR on 15 December 1961. The plan envisaged two separate phases of activity.

Phase I was to provide for the orderly transfer of the facility and resources from Army to USAF control. Phase II was to provide rocket launches and data collection for scientific payloads which must be conducted in northern latitudes, beginning 15 September 1962. The different phases of the Air Force assumption of command were to be carried out over an eight-month period. Beginning in January 1962, there was to be a validation and allocation of manpower spaces, followed by the halt of all rocket firing operations at the RRF in February. In April 1962, the first assignments of military personnel to OAR Detachment #2, Fort Churchill, Canada, were to be made. During April and May the contract with a range contractor was to be let, with the Range Contractor Manager and an initial contractor task force arriving at Fort Churchill soon thereafter. In June, the remainder of Detachment #2 military personnel were to arrive. On 1 July 1962, OAR Detachment #2 was to assume limited operational responsibility for the operation of the RRF on a training basis. Detailed preparations for the first series of research rocket firing operations were to be completed by 1 August, with construction of the facility completed by 15 September and U.S. Army responsibility for the RRF phased out, with the Air Force assuming full responsibility.<sup>1</sup>

<sup>1</sup> "Outline Plan For Assumption of Responsibility and Operation of the Rocket Research Facility, Fort Churchill, Manitoba, Canada," 15 December 1961, by the OAR, USAF.

During Phase I contacts with the Canadian authorities would be made by both Hq USAF and OAR concerning the new agreements which needed to be negotiated. Contract work statements had to be developed and a contractor selected. As far as the problem of logistics was concerned, some support of the RRF would be required by the U.S. Army until the Air Force assumed full operational control about 15 September 1962. By 1 July 1962, however, the contractor should be on the site and prepared to support the RRF operation as outlined in the statement of work.

OAR activities in connection with the RRF were to be directly under the cognizance of the Commander, OAR, until the Commander of Detachment #2 was assigned that responsibility, which should be at the end of Phase I. The Directorate of Test Support, DCS/Plans and Programs, Hq OAR, was to be the Office of Primary Interest (OPI) from 16 December 1961 until the completion of Phase I. Throughout Phase I, AFCRL was expected to provide technical advice and assistance.

Phase II, as indicated, was scheduled to begin about 15 September 1962. At that time, responsibility for the operation of the facility would be assumed by the Commander of OAR Detachment #2, Fort Churchill. Hq OAR, however, would continue to coordinate activities of the Churchill range directly with the U.S. Army, U.S. Navy, NASA, Canadian Army and other agencies. AFCRL, because of past experience with similar operations, aided the Hq OAR staff in setting up the range and dealing with various contractor problems.<sup>2</sup>

Following the presentation of the OAR plan, a conference was held on 18 December 1961 at Hq OAR in Washington, D.C., with the Air Force, the Army and NASA all

<sup>2</sup> Ibid.



represented. The main purpose of the meeting was to discuss the reconstruction plans for the RRF as they might affect operations on the range after the Air Force assumed management responsibility. Although earlier meetings in May and June 1961 had been spent in planning the construction, and later in the fall of 1961 the preliminary specifications had been reviewed, there were still no final drawings available for study by the interested agencies. However, the group at the December conference considered and commented on the latest drawings, specifications and information available from the Army, and made arrangements to study the final construction plan as soon as it became available.<sup>3</sup>

OAR representatives explained at the meeting that it was their intention that a military detachment of about 18 officers and men, with services provided by a range contractor, would operate the RRF. The range contractor would receive, assemble, check out and fire the rockets, operate and maintain the instrumentation, collect data, provide decoded data to range users for analysis, and provide administrative and logistic support as needed. OAR also planned to ask the Canadian Government to expand the support facilities it provided at the RRF so as to include operation and maintenance of the required motor pool, support aircraft and helicopters.

The 15 December plan provided for launching only solid-fueled rockets and for trajectories to be limited to about 300 miles in altitude and 400 miles in range. Although storage and check-out facilities provided a capability to handle missiles of the Javelin-type, use of that type in trajectories of greater range or altitude than mentioned would necessitate approval of a requirement and changes in the US-Canadian agreement. At an 18 December meeting, however, NASA representatives said that their preliminary calculations showed the possibility of reaching 700 miles altitude with a Javelin-type rocket while still holding the ground range to 400 miles.<sup>4</sup>

<sup>3</sup> Ltr., Hq OAR to OAR (RROO), subj.: "Notes of the Meeting to Discuss the Proposed Reconstruction Plan for the Rocket Research Facility, Fort Churchill, Canada," 10 January 1962.

<sup>4</sup> *Ibid.*

The WSMR representative at the meeting felt there was a good chance that the new facility would be completed by November 1962, provided the necessary funds could be released in January 1962 and construction could be started at the earliest possible time in the spring of 1962. An earlier date of completion was considered unrealistic, and failure to go ahead on the proposed schedule would mean that the installation could not be completed until the summer of 1963 at best. To be sure, many in the group felt that even a November 1962 date for completion of the project was too optimistic but Army representatives promised to make every effort to meet the proposed schedule. In answer to specific questions concerning the possible extension of present facilities in lieu of the new construction, they explained that such a plan had already been considered and rejected. The Army agreed to provide funds for any cost of overlap during the turnover of responsibility from the Army to the Air Force. In the matter of personnel, the Army proposed to cut its personnel strength at the RRF in half by 30 March 1962, and then to authorize overstrength where necessary.<sup>5</sup>

Still another meeting was held on 15 January 1962 to discuss OAR's plan for the assumption of management of the RRF. Present were representatives from Hq USAF (AFRDR-AS), Hq OAR, AFCRL, the Office of Chief of Ordnance R&D, the White Sands Missile Range and the RRF. The matter of a completion date for the proposed construction was again discussed at some length. The Army representatives, who had previously thought in terms of a 15 September 1962 completion date, now agreed that a more realistic date, assuming approval and release of funds in early January 1962, would be November 1962.<sup>6</sup>

A further study of the proposed OAR plan for assuming management of the RRF shows that OAR realized that an early assignment of USAF personnel to the RRF to work out details of operation, supply, equipment and

<sup>5</sup> *Ibid.*

<sup>6</sup> Ltr., Hq OAR to OAR (RROO/Col Streeton), subj.: "Notes of the USAF-U.S. Army Planning Meeting for the Rocket Research Facility (RRF)," 15 January 1962.

administrative support with the WSMR representatives was of the utmost importance to the operation. The Army, in this case, was especially concerned over the matter of property transfer. It wanted that phase of the operation to take place at the earliest time acceptable to the Air Force, and definitely no later than 1 July 1962. The USAF agreed to an early discussion on the matter, but made no other commitment, for although the Air Force knew that the existing DOD directive stated that the USAF would assume management of the RRF by 1 July 1962, delayed or changed construction plans could affect the directive.<sup>7</sup>

Other aspects of the OAR plan also seemed to meet with general approval. Although handling most of the logistic load through a contractor and an industrial property account would be a difficult problem, it was assumed the Air Force would be able to solve it. The need for two airmen at the Winnipeg logistics office was considered adequate. Actually, one man would suffice, but a second was needed in the event of illness or other emergencies. Originally it was thought that the Royal Canadian Air Force (RCAF) would operate the motor pool and helicopter services. After considerable thought on the matter, however, RCAF representatives decided against it, and the plan fell through. No decision was considered on that matter for the time being, as new US-Canadian negotiations and contract estimates were yet to be obtained. Army Ordnance R&D representatives expressed a willingness to transfer \$150 thousand to the Air Force to cover Air Force FY 62 expenses at the RRF. It was also emphasized that some operations and technical personnel would remain after 1 July 1962 to insure that an adequate USAF capability for operation existed before the Army phase-out was completed.<sup>8</sup> No DDR&E funds were forthcoming at that time, however.

In the middle of February 1962 the situation concerning the RRF at Fort Churchill took a new turn. After an extensive review by the DDR&E of the continuing requirements of the DOD, NASA and the Canadian

Government for conducting high-altitude probe programs at Fort Churchill, and because of the "austere" funding situation, it was decided to rebuild the old launch complex instead of carrying out the previously approved plan for a completely new facility. The change in plans and the decision to use the old launching site rather than the proposed new one did not alter plans for the Air Force assumption of management of the RRF on 1 July 1962.<sup>9</sup>

The story behind that decision actually goes back to 8 September 1961, when the Army informed the DDR&E that nearly \$3.6 million would be required for construction at the RRF. Having been unable to identify where that amount of money might be obtained for construction, the DDR&E finally inquired of the Secretary of Defense, on 14 December 1961, whether this amount might be provided from the Office of the Secretary of Defense (OSD) contingency (or emergency) fund. The informal reaction from the OSD Comptroller was unfavorable toward that suggestion, and on 18 December the DDR&E orally notified the Air Force that it should develop plans for operations at the existing RRF site.<sup>10</sup> On 16 January 1962 the OSD Comptroller formally notified the DDR&E that the "normal means by which unusual construction is accommodated in the military construction area has been depleted insofar as FY 1962 is concerned."<sup>11</sup> He cited the European build-up in the Army and the Air Force, as well as the missile over-runs in the Air Force, as the reasons behind the depletion of funds that otherwise might be used for the RRF.

Additional facilities, instrumentation and equipment which the operating contractor would need to fulfill the firing program of all users would be provided, although for the time being, because of safety reasons, the rocket firing would be restricted to solid

<sup>7</sup> Ibid.

<sup>8</sup> Ibid.

<sup>9</sup> Memo, DDR&E to Secy. of the Army, subj.: "Fort Churchill," 16 February 1962 and ltr., Asst. Dir., RSGS to E. C. Buckley (NASA), 19 February 1962.

<sup>10</sup> Memo, Brig. Gen. Paul T. Cooper, Asst. Dir. (RSGS) to DDR&E, subj.: "Rocket Research Facility, Fort Churchill, Canada," 5 February 1962.

<sup>11</sup> Memo, J. S. Hoover, DASD(C) to DDR&E, 16 January 1962.

propellant motors. In order to finance the additional instrumentation and facilities needed at Churchill, the DDR&E proposed to use funds then available or to be made available to the Army for support of operations at the RRF (including NASA funds in the amount of \$500 thousand) and also to reallocate Army RDT&E funds to an amount not to exceed \$380 thousand. Further requirements for this project would come from Air Force FY 1963 RDT&E funds programmed for operations at Fort Churchill. OAR was notified of the above decisions by Hq USAF and was reminded that Hq USAF did not plan to provide FY 62 funds to OAR for operations at the RRF.<sup>12</sup>

At this time USAF had no definite construction plans, nor did it know where funds for such a venture were to be obtained. On 20 February 1962, the OCG held another meeting, its eighth, at the Headquarters of the Canadian Joint Staff in Washington, D.C., under the Chairmanship of Colonel Mont S. Johnston. The primary purpose of the meeting was to study the transfer of management responsibilities for the RRF from the U.S. Army to the U.S. Air Force. Matters of timely interest to Canadian and U.S. users of the RRF, in light of the future changeover in management responsibilities, were also discussed.

OAR's representative gave a summary of the Air Force operating and support concepts that would be effective at the time of the Air Force take-over of the RRF. He explained once more that the Air Force planned a resident staff of 15 to 20 military personnel, with all range operations and range support handled by contract. It was thought that the range would be able to accommodate about 90 firings per year exclusive of Arcas sounding rockets,<sup>13</sup> and that firings would be limited to solid-fueled vehicles. The group was reminded, however, that present support plans depended heavily

on the ability and willingness of the Canadian Army and the RCAF to render certain additional support. (It was assumed that formal Canadian concurrence with the revised construction plans would be unnecessary as rehabilitation of the existing site rather than reconstruction in a new area was the only thing involved. The Canadian members agreed with that assumption, but thought that the appropriate Canadian authorities in the National Defence establishment should be informally notified of the change in plans.)<sup>14</sup>

The U.S. Army Commander at the RRF followed the OAR representative, explaining that the Army plans for phasing down activities could not be put in effect as long as operational requirements existed. He explained that a NASA group of Nike Cajun firings was the only series remaining to be accomplished, and that the RRF stood ready to fire that series as soon as appropriate solar activity occurred. The Army felt that in order to phase-out the RRF in an orderly fashion and turn over their property and responsibilities to the Air Force by 1 July, it would be necessary for the physical turn-over to begin between 1 May and 1 June. It was hoped, therefore, to complete the Nike Cajun series in April, both for the sake of turning over the installation to the Air Force on time and to permit an early beginning of the needed construction activity to complete the rehabilitation of the facility. Air Force representatives added that the range would have no capability as of 1 July and hoped there would be no need for any range activity until the contractor rehabilitation work was substantially completed. This did create a problem, since NASA stressed the urgency for a firing capability through the month of June.<sup>15</sup>

This conflict between NASA requirements for firing and the range manager's requirement for an orderly changeover of management responsibilities had all the earmarks of an impasse. Fortunately, the whole issue of launch schedules was finally decided by solar activities, or, rather, a lack of solar

<sup>12</sup> Memo, DDR&E to Secy. of the Army, subj.: "Fort Churchill," 16 February 1962; ltr., Hq USAF to OAR, subj.: "Management of the Rocket Research Facility," 20 February 1962.

<sup>13</sup> The Arcas sounding rocket is a four-finned, single stage, solid propellant, 68 pound vehicle about 8 feet in length and 4.5 inches in diameter. It reaches an altitude of about 37 nautical miles and is mainly used for meteorological probes.

<sup>14</sup> Memo for Record, Hq DA (OCDR), subj.: "Eighth Meeting, Operations Coordinating Group for Fort Churchill," 5 April 1962.

<sup>15</sup> *Ibid.*

activities. No solar flares of a great enough magnitude to warrant investigation by a rocket probe were observed. Thus, as it turned out, the 10 December 1961 firing in NASA's Nike Cajun series was the last research rocket fired under Army jurisdiction of the range.

Various other matters also came up for discussion and settlement. In connection with the technical supervision of rehabilitation work and the transfer of property and management responsibilities, the Army indicated that it would keep a small liaison staff of Ordnance and Signal personnel (about 15 to 20 men) at the RRF for 30 to 60 days beyond 1 July to assist the new range manager in any way possible. Colonel Mont S. Johnston, Chairman of the OCG asked that all range users submit tentative schedules of firings planned for FY 63.<sup>16</sup>

OSD felt that the Air Force should be represented on the OCG. Lieutenant Colonel Albert C. Trakowski, Jr., Hq USAF representative at the meeting, suggested an addition of two Air Force members to the Group; but the seven-man OCG structure was retained, with one Air Force representative replacing the Army representative. Lieutenant Colonel Dale Denman, Jr., the OSD representative, indicated that with the Air Force takeover at Churchill, it would be appropriate for the Air Force to designate a member of Hq USAF to be the new Chairman of the OCG. The OCG representatives designated Colonel Trakowski as tentative Chairman-designate, with Colonel Jack W. Streeton, Hq OAR, as the alternate member.<sup>17</sup>

The proposed plan never did get beyond the planning stage, however. USAF representatives pointed out that this would place the OSD representative in the position of serving in a group chaired by the representative of one of its own subordinate services. Consequently the plan was dropped. The first Air Force representative on the OCG was appointed and took up his duties on 1 July 1962. He was Lieutenant Colonel Leon Stone, Hq USAF, another Air Force officer who had been intimately

involved in the Churchill operation from the very beginning. Colonel Streeton was retained throughout as the USAF alternate member.

Representatives of the Army and Air Staffs met on 8 March 1962 and drew up a Memorandum of Agreement for the transfer of responsibility of the RRF at Fort Churchill. Generally it spelled out those matters that had already been discussed concerning reconstruction of the launch site, the date the Air Force would assume responsibility, phased withdrawal of the Army personnel, and the transfer of facilities, equipment, funds, etc. It was submitted to the Chiefs of Staff of the Army and the Air Force for their consideration. The Chief of Staff, USAF signed the agreement on 20 March 1962, with the Chief of Staff, Army following suit on 2 April 1962. (See Appendix B)

On 12 March 1962, WSMR notified the Commander of the Second Air Force (SAC), that the responsibility for the management of the RRF was to be transferred to the OAR on 1 July 1962 and that:

In consideration of this change of command for the Ordnance Rocket Research Facility, White Sands Missile Range now desires to effect the cancellation of the agreement between the Commanding General, WSMR, USA, and the Commander, SAC, USAF, for support of the 3949 Air Base Squadron, SAC, Fort Churchill, Canada. The cancellation of this agreement and the support it encompasses to be effective 30 June 1962.<sup>18</sup>

WSMR requested acknowledgement of the cancellation by 30 June 1962 at the latest. On 17 March 1962, SAC concurred with the cancellation as requested, anticipating no major problems in reaching a satisfactory agreement with OAR.

A WSMR-OAR joint transfer plan for the RRF was drawn up on 27-28 March 1962 by representatives of the two organizations. On 4 April 1962, WSMR forwarded a copy of the plan to the Commander of OAR for review, approval and signature. The plan,

<sup>16</sup> Ibid.

<sup>17</sup> Ibid.

<sup>18</sup> Hist of WSMR, Vol. I, 1 Jan.-30 June 1962, p. 33.

having been approved and signed, was published 24 April 1962 as the "White Sands Missile Range-Office of Aerospace Research Plan For Transfer of Rocket Research Facility." The purpose of the joint plan was, of course, to carry out the recent Air Force-Army Memorandum of Agreement. Both agreed, as had been previously decided, that 1 July 1962 would be the date the Air Force would take over management from the Army. The Army was to maintain its firing capability for any launches scheduled prior to 30 June 1962. Firing operations at the RRF would then be shut down from 1 July to 1 November, so that the construction of range facilities could be completed as scheduled, with a Beneficial Occupancy Date (BOD) of 1 November set for the use of the rehabilitated rocket facility. By that date it was assumed that the Air Force would have attained a capability to launch rockets at the RRF. Plans called for a launch capability to handle Javelin, Nike Cajun, Astrobee and Black Brant (Canadian) rockets that do not exceed 4,000 lbs. of Class IX propellant or equivalent. Eastern Ocean Division, Corps of Engineers, was responsible for construction of the launching facilities as approved and funded.<sup>19</sup>

Unlike the U.S. Army management of the range, the Air Force planned to operate with a very austere complement of military personnel and to depend upon a large contractor force to perform many of the tasks previously performed by Army personnel. The Army had operated the range with about 175 military personnel, including the 36 in their communications detachment and the 43 manning the motor pool and helicopter operations with another 27 directly in support of those activities. More personnel were actually authorized, although the above number were effectively operating the old range but with a reduced rate of rocket firing. A contractor force from Aerojet General Corporation was used for missile operation, which included the receipt, storage, preparation and firing of rockets and missiles. Land-Air, Incorporated, performed range instrumentation duties including telemeter-

ing. The Air Force's total military complement was to consist of 10 officers and 10 airmen. Sixteen officers and airmen would man the range at Churchill; two airmen would be at the liaison office at Winnipeg, Manitoba, Canada. Two officers would remain in OAR headquarters in Washington, D.C.

Approximately 29 U.S. Army personnel were to remain at the RRF for a period of 60 days after 1 July to orient U.S. Air Force and contractor personnel in range operations and to effect an orderly mission transition. The U.S. Air Force could provide military personnel as early as it liked, but not later than an established date in June. All U.S. Army personnel remaining after 1 July were to be attached to the Air Force's Office of Aerospace Research, Detachment #2, Fort Churchill, Canada. On that date the Air Force would also assume operational responsibility of the Winnipeg Liaison Office from the Army.

OAR Detachment #2 was "designated and organized" at Fort Churchill on 1 March 1962.<sup>20</sup> Air Force personnel began moving into Churchill in the same month, Major William G. Barneyback reporting to Churchill on 22 March as an advance party of one. Other members of the Detachment began arriving in April and May, and by the end of June all personnel were present for duty at Churchill with the exception of the new commander, Lieutenant Colonel Jerry F. Flicek, and the Missile Officer of the Operations Division, Captain Paul D. Marks. These two officers arrived the 4th and 13th of July, respectively.

Contractor personnel for the operation and maintenance of the RRF were also phased into the Churchill Operation during this period. On 1 March 1962, the Air Force Office of Scientific Research (AFOSR) issued competitive bid announcements for the operation and logistic support of the RRF through the U.S. Department of Commerce and the Canadian Commercial Corporation in Canada. More than 50 companies expressed interest in the announcement and attended a pre-bid conference held in Washington, D.C., on 23 March. Twenty of the

<sup>19</sup> "WSMR-OAR Plan for Transfer of Rocket Research Facility," 24 April 1962.

<sup>20</sup> S.O. G-7, Hq OAR, 28 February 1962.

company representatives actually visited Churchill to look the situation over. Proposals were finally submitted by 12 Canadian and U.S. firms in April. These were evaluated the last part of April from the standpoint of both technical and cost proposals. The contract was awarded to the Pan American World Airways Company of New York City (PAA) on 15 May 1962.<sup>21</sup>

PAA moved into the Churchill operation in three phases. Phase I covered the period from 15 May to 30 June, and called for contractor personnel to be on site by approximately 15 May to accomplish inventory and to assume responsibility for Government-owned property, supplies and materiel. This phase was accomplished by the PAA Project Manager and PAA personnel on TDY from PAA facilities at Patrick AFB, Florida. Phase II spanned the period 1 July to 31 October. It called for the contractor to assume responsibility for maintenance and housekeeping of the existing RRF property, at which time the Army could consider itself relieved of all responsibility at the RRF except for the construction supervised by the Corps of Engineers. PAA contractor personnel would also, during this period, begin reopening various sites and reinstalling equipment so that the range would be in operational readiness by the 1 November reopening date. The final phase, Phase III, was scheduled to begin 1 November 1962, at which time the contractor would assume full responsibility for the operation of the RRF.<sup>22</sup>

The PAA work force that was to handle the operations of the RRF was to be composed of about 72 percent Canadian citizens. (When the range finally opened 1 November 1962 there were 154 PAA employees on the payroll, of which approximately 75 percent were Canadian citizens. This force now has grown to about 200 employees.) The entire PAA force was to be on site by 1 November, the date of the formal reopening of the RRF under USAF management, but prior to that time they were taken on individually as the various jobs became

necessary. Construction, such as work on the rehabilitation of the range head facilities, was to be handled by Carter Construction, Limited. This firm was awarded their contract after having their bid accepted by Defence Construction Limited (DCL) and the U.S. Army's Corps of Engineers, Eastern Ocean District (since redesignated New York District).

Supply, communications, maintenance and transportation functions were also to be phased into the Air Force assumption of duties. All non-expandable appropriated and non-appropriated property was to be jointly inventoried by the Army, Air Force and Air Force contractor as of 15 May on an "as is, where is" basis. Completion and transfer would be accomplished by 30 June. Equipment being used by Army contractors at that time was to be inventoried and transferred on or about 1 July. Expendable items in consolidated supply and unit supply would be transferred as a dollar value inventory. Expendables being used at the time by the Army contractors also were to be pre-inventoried and transferred on or about 1 July. An Industrial Stock Record Account (H) was to be established by the Air Force as of 15 May, and the Air Force contractor would assume base supply responsibilities at Fort Churchill prior to 30 June. Until the 30 June deadline, the Army would continue to requisition the required equipment and supplies.<sup>23</sup>

As to communications, the Air Force was to assume the management, with coordination and approval of Headquarters USAF (Communications Division) and the Canadian Department of Transport, of all radio frequencies being used by the U.S. Army at Churchill.

Concurrent with the transfer of equipment from the Army, the Air Force was also to assume maintenance responsibilities. This included buildings, vehicles, equipment, and the telephone microwave line from the point of Canadian Government control to the range sites.

In the transportation field, the Air Force would assume motor pool operations upon transfer of vehicles, although U.S. Army

<sup>21</sup> Interviews with Lt. Col. Kimbrel and Capt. Hooper, 23 September 1963.

<sup>22</sup> *Ibid.*; "WSMR-OAR Plan for Transfer of Rocket Research Facility," 24 April 1962, Annex "C".

<sup>23</sup> *Ibid.*; See also Annex "B".

personnel were to assist the Air Force contractor until the Army left Churchill. A Transportation Officer (military) capable of issuing Travel Requests, Government bills of lading, etc., was to be designated by the Air Force. Moreover, prior to 15 June, the Army and Air Force were to initiate action to effect a change-over on vehicle and aircraft registration (to be effective at the time of transfer). PAA would be responsible for operating and maintaining the helicopter service. The Army's four helicopters, two H-13's and two H-21C's were turned over to the Air Force. The Air Force kept the H-21C's, but brought in one of its own winterized, heavy duty H-21B's from Thule, Greenland, in the fall. The two H-13's were returned to the Army. It was anticipated, finally, that the Air Force would continue to have a requirement for MATS airlift for cargo and personnel.<sup>24</sup>

On 18 May, as the time for the Air Force assumption of command drew near, new Terms of Reference for the RRF's Canada-United States Operational Coordinating Group were drawn up to reflect the change in membership. (See Appendix C) The OCG would still be comprised of seven members, but the member for the Office of the Secretary of Defense would be the Chairman. An Air Force member would replace the Army member, of course. The NASA, Canadian Army and Canadian Defence Board membership would remain the same. The changes in the Terms of Reference were to be effective 1 July, the same date the Air Force assumed management responsibility of the RRF.<sup>25</sup>

Colonel Mont S. Johnston, outgoing Chairman of the OCG, forwarded a copy of the revised Terms of Reference to the Assistant Director of Defense Research and Engineering (Ranges and Space Ground Support) on the same date and also reported informally the awarding of the range operating

contract to Pan American World Airways, as well as a construction contract to the Carter Construction Company, Limited, of Canada. In addition, a tentative firing schedule for FY 63 had already been requested and received from the various range users, consolidated by the OAR, and was on its way to the OCG and to Ottawa for the necessary Canadian coordination. The schedule called for 14 shots in the 4th Quarter of CY 62, 24 in the 1st Quarter of CY 63, 24 in the 2nd Quarter CY 63, 21 in the 3rd Quarter CY 63 and 25 in the 4th Quarter 63 for a total of 108 firings. Of these AFCRL would conduct 36, NASA 38 and Canada 34. In addition to those firings, approximately three Arcas rocket vehicles a week would be fired for meteorological information. There would also be extensive balloon launchings in connection with the U.S. Navy's SKYHOOK program.<sup>26</sup>

On 22 May 1962, WSMR requested the Army Audit Agency to conduct a close-cut audit of the RRF prior to 1 July 1962. In June, however, the Army Audit Agency notified WSMR that a higher priority workload made it impossible to conduct the requested audit. The agency recommended that all documents and records covering appropriated fund activities be shipped to WSMR when the RRF was closed out on 30 June 1962.<sup>27</sup>

Most details of the actual changeover in command seemed to have been worked out as the month of June rolled around. On 20 June, Hq USAF notified OAR that the "White Sands Missile Range - Office of Aerospace Research Plan for Transfer of Rocket Research Facility" had been reviewed and approved.<sup>28</sup>

The changeover in management from Army to Air Force took place on 1 July 1962, as planned, but Lieutenant Colonel Jerry F. Flicek, first USAF commanding officer of the RRF, did not take over his new duties until 4 July. In Colonel Flicek the Air Force seemed to have found a commander well suited for the forthcoming operation of the Churchill range. The job

<sup>24</sup> *Ibid.*; interview with Maj. John J. Apple, OAR and Lt. Col. Claude R. Kimbrel, OAR, 22 October 1963.

<sup>25</sup> Memo, Hq DA (OCRD) to Asst. Dir. of Def Res & Engr (RSGS), subj.: "Rocket Research Facility, Fort Churchill, Canada," 18 May 1962, w/Incls. #1 & #2.

<sup>26</sup> *Ibid.*

<sup>27</sup> *Hist of WSMR, Vol. I, 1 Jan.-30 June 1962*, p. 36.

<sup>28</sup> Ltr., Hq USAF to OAR (RRO), subj.: "Transfer of the Rocket Research Facility," 20 June 1962.



Air View of the Range Head at the Churchill Research Range



not only called for a thorough knowledge of missiles and range management, but also for the right amount of tact and diplomacy needed to deal with a friendly foreign power on its own territory. Colonel Flicek had these qualifications. Besides nearly 16 years of missile experience behind him, covering almost every aspect of missile activity, Colonel Flicek was coming directly from a four-year assignment with the Ministry of Aviation in London, England, during which time he directed many guided missile activities for the British Government.

Colonel Flicek notified the Commanding General, WSMR, on 5 July that all facilities

and equipment had been successfully transferred as of 0001, 1 July 1962. A few minor details were left to be worked out, but by 16 July, OAR could inform the Office, Chief of Ordnance, U.S. Army, that all Army records had been shipped to the WSMR for audit as recommended.<sup>29</sup>

This was only the beginning for the Air Force, however, for OAR still had before it the task of readying the range for the anticipated 1 November 1962 reopening.

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<sup>29</sup> Hist of WSMR, Vol. I, 1 Jan.-30 June 1962, p. 37.

## RANGE FACILITIES

Before going into the problems facing the Air Force, and particularly OAR, after the acquisition of the rocket range, it might be well to pause and give the range facilities at least a cursory look. The most noticeable feature at first glance is that the Churchill Research Range (or Rocket Research Facility as it was still called prior to 1 November 1962) is a vast geographical area covering hundreds of square miles of both land and water. The range can be divided into three parts -- the inner sphere of range activities, which are centered around the military camp of Fort Churchill; the ring of outer instrumentation sites, which form a semi-circle around the inner sphere of range activities; and the impact area, which stretches out over Hudson Bay.

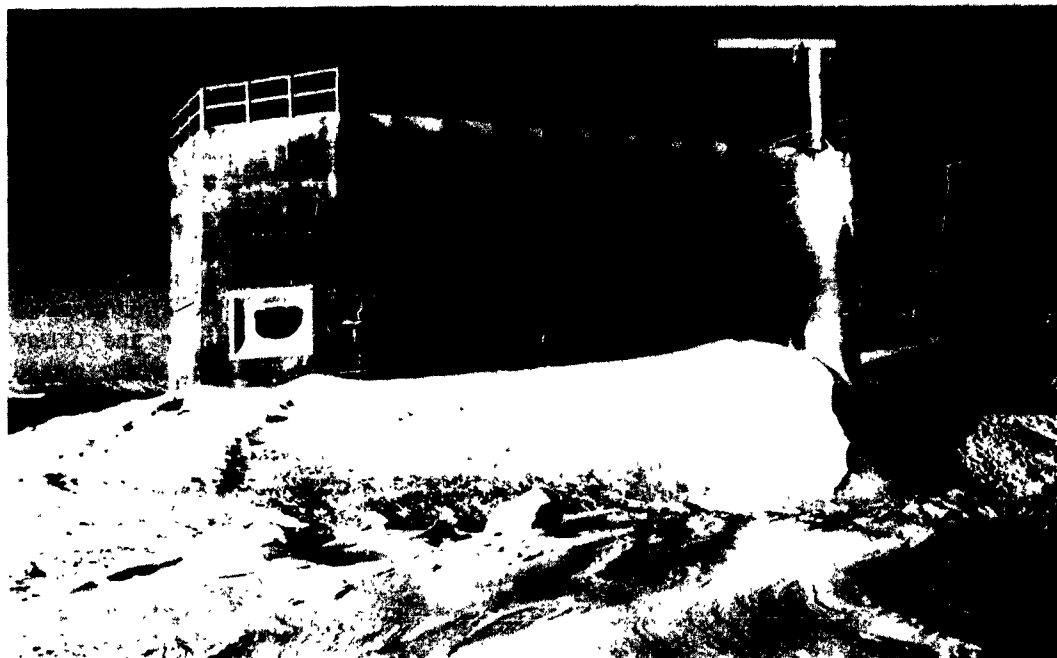
Most of the Churchill range's area is devoted to the impact area. This area is a vast funnel-shaped zone approximately 100 miles wide at the neck, or Churchill end, and flares out to a width of 400 miles at the far end of the range. The distance from end to end is also about 400 miles, the entire impact area being within the Hudson Bay area proper. Special care must be taken to insure that all ships and airplanes have been warned to stay clear of the area during periods of rocket firing. Because of possible danger to nearby airstrips and planes as well as wandering groups of Indians or Eskimos, it is imperative that the various rocket stages and payload nose cones are impacted within the prescribed range limits. In the future, during contemplated longer range rocket launchings, the range will be expanded to include virtually the entire Hudson Bay area, on an "as required" basis.

The ring of four instrumentation sites surrounding the inner sphere of range activities is composed of Eskimo Point, about 170 miles north of the base camp; Seal River, about 70 miles northwest of the base camp;

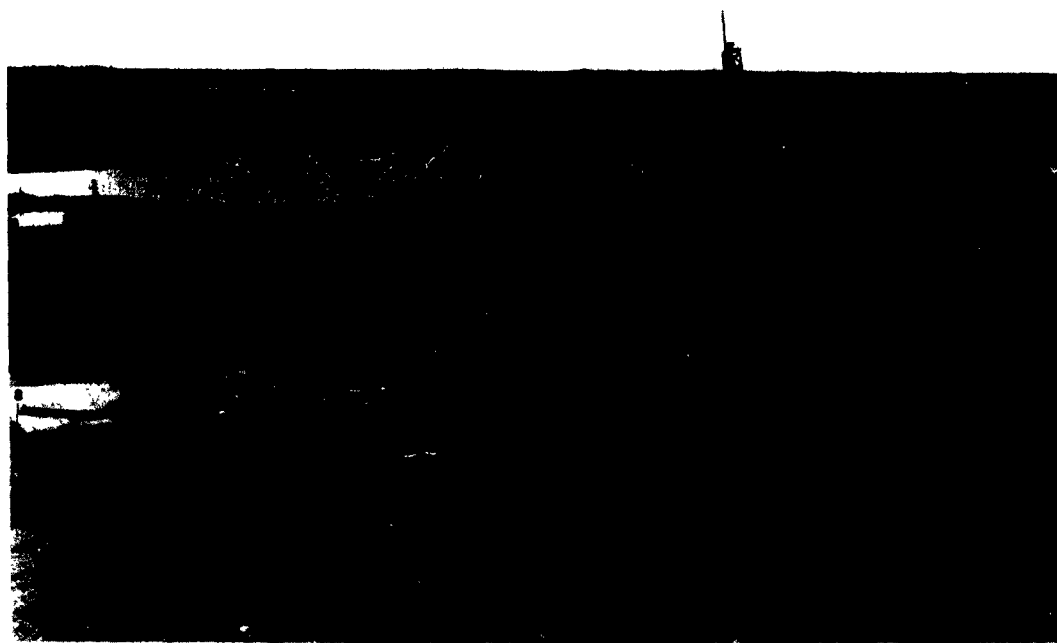
Belcher, about 60 miles south of the base camp; and O'Day, about 85 miles south of the base camp. The Belcher and O'Day instrumentation sites are actually owned and operated by the Canadian Defence Research Northern Laboratories (DRNL). They nevertheless comprise a portion of the Churchill range complex and support the range with specialized instrumentation.

Within the inner sphere of range activities is the base camp. Housing for the administrative, supply and logistic activities is all located in this area. The facilities of the DRNL at base camp are also used as an instrumentation site (in addition to the four already mentioned). Two other instrumentation sites are located nearby--Digges Siding, about 12 miles south of the base camp and Twin Lakes, about 22 miles south of the camp. The latter consists of two buildings that house power generating equipment, a sound ranging instrumentation system, communications, a DoVAP receiving complex, telemetry ground station, and a wide array of recording instruments. The Digges Siding site is smaller, having only power generating equipment, communications network and a DoVAP receiving complex. Additional facilities in the base camp area include the frequency monitoring site, formerly bordering on the base camp proper but now located at the range head, and a radar site six miles out from the camp on the way to the range head. The range head itself is about 12 miles southeast of the base camp.

A wide variety of activities are represented within the range head area. The central point of interest, of course, is the area containing the four launching complexes--Nike Cajun, Aerobee, Universal and Black Brant. A blockhouse, serving as a nerve center for all rocket launchings, ties these four complexes together. To support range head activities, a



Winter View of the Blockhouse at the CRR Range Head



Nike Apache Rockets Ready for Firing (Operation PROBE HIGH)

sprawling operations building houses such diverse facilities as instrumentation, transmitting and receiving equipment, limited weather forecasting instruments, communications, fire prevention apparatus, medical aid equipment (including an attached ambulance), messing, user preparation, etc. Although the range head also has its own steam and power plant, a certain amount of support, primarily road service, water supply and fuel transport, is still provided by the Canadian Army.

All told, there are ten different instrumentation or range support activities provided to users of the Churchill range. First there is the frequency monitoring station, consisting of electronic equipment capable of scanning the frequency spectrum from 15 kilocycles to 10.75 kilomegacycles. The station is operated during every rocket firing operation, both for the purpose of locating any stray frequencies that may be present in the range vicinity, and as an assurance that all of the range's equipment is operating on the correct frequency. If interfering frequencies are not immediately identified and eliminated during the firing test, they may have an adverse affect on the various instrumentation collecting devices. The result would be degraded data, which would probably be of marginal use to the user.

Then there is the radar site. At that location are three MPS-19 tracking radars, a Reeves computer, automatic plotting boards and an Austin data recorder. The tracking radars all have a slant range capability of 1000 nautical miles. The Reeves computer and the automatic plotting boards enable the range operators to take the tracking radar's slant and convert it into real-time displays. With this system the range operators have the capability of displaying ground positions, height and range simultaneously. The Austin data recorders are used to feed slant range, azimuth and elevation, timing, etc., onto a 1/4" magnetic tape. This data can be reduced later and provided to the user in the form desired. Formerly the radar site also contained a 504 area surveillance radar (Canadian owned and operated), which was used only for range clearance purposes

(aircraft, etc.). It was recently moved to a new location on the west side of the north-south runway.

The Doppler Velocity and Position System (DoVAP) is a multi-station system which utilizes the Doppler principle of radio frequencies to obtain accurate trajectory information, including position, acceleration and velocity of a rocket. Basically, the DoVAP system consists of a transponder in the rocket and five ground stations. These include the transmitter station located at the radar site, and the four ground dual receiving stations located at the base camp, the range head, Twin Lakes and Digges Siding.

During an operation, the 2000 watt output transmitter at the radar site sends out a reference signal of 38.031 megacycles to the rocket and to each of the four ground receiving stations. In the rocket, the transponder receives the signal, doubles it in frequency and retransmits it to the four ground receiving stations. At each of the ground receiving stations the reference signal is compared with the signal received from the rocket transponder. The result is a Doppler effect based on the velocity of the rocket. The Doppler frequency, together with the range timing data is recorded on magnetic tape at each of the receiving stations. These frequencies, in turn, are centrally recorded at the operations building via a microwave link including the range timing signal. Integration of the Doppler cycle over an interval of time represents a change of pathlength from the ground transmitter to the rocket and back to the ground receiver. This pathlength is non-directional and so defines an ellipsoid of revolution with the foci at the receiver and transmitter. The exact position of the rocket in space is computed by determining at what point three or more ellipsoids intersect one another. Usually the data obtained includes three coordinate space positions with the velocities derived from the position differentials.

There are no facilities at the Churchill Research Range with the capability of reducing raw DoVAP data, but the range does have a working arrangement with Patrick Air Force Base for accomplishing this for the user.

Also located at the CRR are two ground telemetry receiving stations. The main telemetry station is located at the range head and the back-up telemetry station at Twin Lakes. These stations have the capability of tracking and receiving up to four links of telemetry data from the rocket in five different receivers having a frequency range of 55 to 260 megacycles. As the received data is recorded on two 1/2" Honeywell magnetic tape recorders, this provides a hundred percent back-up of raw data recording.

The facilities of the CRR are able to provide 14 channels of discriminated data during a shot employing standard AM/FM and FM/FM transmissions from the rocket. The range has one discriminator for each of the 23 Irig (Inter-Range Instrumentation Group) bands and can provide 14 of these in real-time at the user test conductor position.

In addition, the range has two 36 channel CEC oscillographs and two 8 channel Sanborne recorders for data recording. These are both examples of real-time displays in that they give out a visual print of the information picked up on the aforementioned frequencies (55 to 260 megacycles).

The Twin Lakes back-up telemetry station has four receivers and a 1/2" tape recorder for recording the received telemetry data from the rocket. There is no real-time display facility available at this station.

The range timing transmitting system is located in the operations building at the range head. This timing equipment is capable of providing Irig "B" (100 pps) and Irig "C" (2 pps), AMR D5 (100 pps) and AMR B1 (1 pps) timing formats. Timing is transmitted via hard line to the telemetry section and to the radar site, base camp, Digges Siding and Twin Lakes instrumentation sites via the timing transmitter, which operates on either 166.225 or 166.425 megacycles. The resulting signal is a continuous one and is concurrently received at the stations by timing receivers and recorded on tape with other instrumentation data resulting from the rocket firing. Two pps (pulse per second) timing via a hard line to the Twin Lakes, base camp, radar

and range head sites is also available and can be recorded on the data tape. Only two timing codes can be transmitted at one time by the timing transmitter, however.

A signal generated by a micro switch located on each launcher indicates the first motion of the rocket when it is fired. The micro switch initiates a first motion pulse which is superimposed on the timing train at all stations. This pulse permits the user to determine zero timing or exact lift-off time for data reduction or flight analysis purposes.

Fort Churchill's sound ranging system is located at the Twin Lakes instrumentation site. It consists of an array of five microphones with associated equipment which are located in a symmetrical pattern and surveyed to the first order. This sensitive equipment serves to detect sound waves produced by devices exploding in the atmosphere or sound waves generated by objects impacting on the ground. So delicate is this system that it is capable of recording audio frequencies as low as four cps (cycles per second), thus making it possible to even detect polar bears and trappers in the area, as well as the sound of a closing car door. The detected sound signals are recorded along with range timing on an Ampex 7 track magnetic tape recorder and a CEC oscillograph recorder.

The sound data detected and recorded by the sound ranging system (SOTIM, meaning Sonic Observation of the Trajectory and Impact of the Missile) enables the user, by means of triangulation, to fix the impact position of the hard bodies and/or any noise-making devices utilized in payloads that explode in the atmosphere and are within effective range of the microphone array. The effectiveness of the sound detection and measuring equipment is influenced by such variables as range, altitude, size of explosion, wind, noise, etc. And when compared to vehicle position the sound detection system provides wind and temperature measurements from exploding grenades.

Communications at the Churchill range consist of (1) a Radio Frequency (RF) ground to ground system, (2) emergency hard lines, (3) an RF portable system, and (4) an RF mobile system.

For point to point communications in the inner sphere of range activity, under normal conditions, the CRR utilizes AN/TRC-24 FM communications in conjunction with AN/TCC-7. The AN/TCC-7 provides compatibility between the AN/TRC-24 Receiver Transmitter and voice equipment, with each frequency having a limit of 12 voice channels. It is not capable of handling timing, telemetering, DoVAP or radar data. This equipment is semi-mobile, can be set up in the field and can be oriented to provide voice communications. It operates in a frequency range of 225-400 megacycles and has a 100 watt output.<sup>1</sup>

The stations at Digges Siding, Twin Lakes, the range head, the radar site and base camp all operate with the above system, with the master station at the launch site. Dukane equipment is radio communications equipment used as communication from one point to another (voice channel), which provides the terminal distribution. The following nets are presently used at the CRR: rocket operations, communications, DoVAP, frequency monitoring, beacon, range safety, observer and user.

In addition to the RF ground-to-ground communications system, there is a very limited emergency hard line system. This system consists of six pairs of lines which tie in the various points of the inner sphere of range activities (base camp, radar site, launch area, etc.) and provides emergency safety phones en route to the various site locations.

A third communications net consists of an RF mobile transistorized system having an 80 watt output. This includes 55 mobile units with a two frequency option and two fixed ground stations; one located at the base camp, the other at the range head.<sup>2</sup> An important feature of this net is that the equipment also provides for the safety of

the range personnel during the winter months when vehicles are allowed on the range only if they are equipped with operational communications equipment.

To satisfy the long range communications requirement of tying in the outer ring of instrumentation sites with each other and with the other facilities, single side band Collins KWM-2A equipment operating in the frequency range of 4.5 to 5 and 6.5 to 30 megacycles is utilized. At times a Collins linear amplifier is also employed. This unit increases the power output from 100 to 300 watts and provides extremely good range characteristics.

Another important facility at the CRR is the Search and Rescue and Homing (SARAH) system. This equipment is utilized to physically locate impacted nose cones containing specialized data collected during the flight of rockets through the atmosphere. It is imperative that these nose cones, with their instrumentation packages, be recovered and returned to the user for analysis and data reduction. Basically, the system consists of a SARAH transmitter, located in the nose cone of the rocket, and four receivers. Three of these receivers are located in aircraft, one in an RCAF Otter aircraft and two in USAF helicopters. The fourth is located in a ground station at the range head.

After a fired rocket, employing SARAH, reaches apogee; the nose cone, containing the specialized instrumentation package and the SARAH transmitter, is ejected. At this stage a parachute automatically opens, allowing the nose cone to slowly settle to the ground. The SARAH transmitter sends out a continuous signal both during the parachute-assisted descent of the nose cone and after it has impacted. This transmission is received by the three airborne receivers already discussed. By homing, and with the aid of vectoring information provided by the SARAH ground receiver and the search and tracking radars, it is possible to locate the nose cone and allow a helicopter to recover it. The maximum range of this equipment is about 50 miles.

Among other things the CRR has a capability to provide a whole range of weather data to the users. This service

<sup>1</sup> Later this was changed to a Lenkurt Microwave system consisting of type 74B microwave equipment and type 45BX carrier telephone system for radio operating at a range of 5925-6425 megacycles. Included was an automatic dial telephone system providing a 99 telephone capability. The system provided for voice, timing, telemetry, DoVAP and could be expanded to a 300 channel capability.

<sup>2</sup> CRR expects to increase this number to 75 by the Fall of 1964.

ranges from straight weather forecasting to providing data on winds aloft, barometric pressures, temperatures, humidity, etc. The range also has a AN/GMD-1A Rawin set with associated equipment to provide radiosonde data to the users.

The installation of a micro-wave communications system is normally a three year job by the time the request is approved, procurement functions set up, bids let and actual installations accomplished. In this case, it was completed between January and December 1963, although actual work on the installation didn't get started until May. Testing of the system took place the last week of October, and the system was pronounced ready for operation on 29 November. The complete installation of this complicated system was quite an accomplishment in that short period of time, considering the amount of time that is normally required for installation. It is indicative, however, of the manner in which CRR problems are handled by the Hq OAR staff and the range.

Likewise, this same spirit of accomplishment can be seen in the installation of a closed-circuit TV set-up between the block-house and the three launcher buildings. The TV can also be used for area-surveillance, for it has the capability of observing Black Brant launchings. Work was started in mid-May 63 and progressed from specifications to procurement and completion in time to observe the July 20th solar eclipse shots.

Though the rockets themselves are not considered a facility of the range, since the entire range is oriented toward firing various types of rockets to obtain the technical data needed, a discussion of the types of rockets used is certainly in order. The range has, or plans to have, the capability for the receipt, storage, handling, preparation and firing of the following types of rockets: Nike Cajun, Nike Apache, Arcas, Astrobee 200, Aerobee 150, Black Brant IIA, Aerobee 300, Black Brant IV and Javelin. None of the last three rockets listed has been fired from the CRR. Because of the ranges of these three rockets the facilities at Churchill were inadequate. The possibility of enlarging the impact area, both as to length and width, to accom-

modate these rockets was discussed between US and Canadian officials.<sup>3</sup>

These rockets vary in size from the small 8-foot Arcas sounding rocket to the 48.7-foot, four-stage Javelin. The Arcas, a four-finned, single-stage, solid-propellant, sounding rocket used for meteorological probes, is only 4.5 inches in diameter. Despite its small size and light weight (68 pounds), the Arcas is capable of pushing a 16.5-pound maximum payload to an altitude of 37 nautical miles.

The Nike Cajun and Nike Apache rockets are very similar in most respects. They are both two-stage, solid-propellant, four-finned rockets. Dimensions are nearly identical, except that the former is slightly longer -- 26.3 feet as against 24.6 feet. The Nike Cajun is made up of a Nike Ajax booster (first stage) and a Cajun rocket (second stage), weighing a total of 1518.9 pounds (less payload) at launch. The Nike Apache is composed of a Nike Ajax booster (first stage) and an Apache rocket (second stage), for a total launch weight of 1526.6 pounds (less payload) at launch. The Nike Apache is composed of a Nike Ajax booster with a 50-pound payload.

The Black Brant IIA, a Canadian rocket, is about the size of the two Nikes (26.6 feet long with a 17.3-inch diameter) but considerably heavier (2,450 pounds, less payload). It is a single stage, three-finned, solid-propellant rocket capable of boosting a 150-pound payload to an altitude of 145 miles.

Also fired on the range is the Astrobee 200. This four-finned, two stage, solid-propellant rocket measures just over 28 feet in length and weighs in, at launch, at 2688.8 pounds (less payload). It uses a Nike M5-E1 booster as the first stage.

Similar in many respects is the Aerobee 150. Having an overall weight (less payload) of 1943 pounds, this three-finned, two stage, 29.6-foot rocket is the only liquid-fueled

<sup>3</sup> Enlargement of the range was finally approved by the Canadians during the period December 1963 - January 1964. This was not a blanket approval, but was to be handled on an "individual shot" basis. That is, each scheduled shot requiring the expanded range boundaries must be submitted to and approved by the Canadian authorities in advance. No shots requiring the expanded range were to be made during the shipping season - 15 July to 15 October.

rocket fired on the Churchill range. It is capable of reaching an altitude of 117 nautical miles with a payload of 150 pounds.

Yet to be fired on the Churchill range is the 48.7-foot, four-stage, solid-propellant Javelin. This rocket is made up of an Honest John booster, two Nike Ajax boosters and an Altair (X 248-A6) booster. It weighs in (less payload) at 7392.4 pounds at launch and is capable of lifting a 60-pound payload to an altitude of 800 nautical miles.

Also contemplated for future use is the Canadian Black Brant IV A, using a Black Brant I as the first stage and a Black Brant III as the second. Measuring 36.3 feet in length, this research vehicle weighs (less payload) only 2,989 lbs. It is of two-stage, solid-propellant design and is capable of lofting a 40-pound payload to an altitude of 620 miles. Like the Javelin, this rocket too will need an expanded impact area to cope with its greatly expanded range.

The third rocket not yet fired from the CRR is the Aerobee 300 (Spaerobee). This two-stage, solid-propellant rocket is made up of an Aerobee 150 (with booster) and an Aerojet Sparrow. It is tower-launched, is 33 feet long and has a flight weight (less payload) of 1508 pounds. It can lift payloads of 30, 50 or 90 pounds to (respectively) altitudes of 310, 260 or 200 nautical miles.

Not to be overlooked when discussing the range and its facilities is the support provided by the Canadian's Defence Research Northern Laboratories (DRNL). This includes instrumentation requirements for the Belcher and O'Day sites as well as communications between the aforementioned sites, spectrometers, auroral radar, ionosonde graphs, coordination with Prince Albert Radar Facility, height finders, photometers, cameras, etc. In addition, they provide technical services and advice when requested by the users.



and reinforcing steel). Additional material was enroute. All the required equipment for that phase of construction was on the job site, with the construction camp, quarters, messing facilities and field offices established. Site work and grading at the locations to be occupied by the block house, hazardous assembly building, launcher building and personnel and missile tunnels were already under way. Construction of foundation forms was nearly complete. Placing these forms and pouring the concrete foundations at the block house site began soon afterwards.<sup>2</sup>

During a meeting on 13 August between EOD Engineers and Colonel Flicek and his staff it became fairly clear that the 1 November operational date meant one thing to the EOD Engineers and had quite another meaning to the OAR detachment. As a result, the EOD representatives were quite taken back when they learned of OAR requirements for the new buildings. To the Engineers, a 1 November operational date meant having all the facilities ready to turn over to the Air Force for their use on 1 November. To OAR a 1 November operational date meant being ready to fire rockets on 1 November. This meant, according to the OAR interpretation of "operational date," that the building itself would have to be ready for use about 30 days prior to the operational date so that all types of equipment, necessary cabling, etc., could be installed and checked out. EOD's first reaction was to treat the OAR requirements as new requirements. If this were so they could not possibly be met in the time available. After considerable discussion with CRR representatives over the reasons for early entry into the buildings, the EOD Engineers promised to push their work so that early entry in some of the buildings might still be possible. While OAR representatives were gratified that the effort would be made, they were not optimistic on the results, considering the late date.<sup>3</sup>

<sup>2</sup> Annex No. 2 of "Report of Operations at the RFOAR," 20 July 1962.

<sup>3</sup> Annex No. 1 of "Report of Operations at the RFOAR," 29 August 1962.

As a result of this meeting, representatives of OAR reminded those of the EOD that OAR had provided all funds and other support requested by the EOD, and had supplied them within the time limits established. It was further noted, by OAR representatives, that OAR had required no changes in plans or designs that would delay the construction. For these reasons OAR expected EOD to produce and considered any delay on its part unacceptable.<sup>4</sup> The biggest concern on the part of OAR was that an excessive amount of slippage would occur so that the construction could not be finished during the 1962 construction season. In connection with the construction program during this period, CRR representatives made the following recommendations:<sup>5</sup>

- (1) Remove the sharp turn in the missile passageway leading from the hazardous assembly building to the launcher. By replacing the sharp turn with two shallower turns it would be possible to move long rocket vehicles through the passageway.
- (2) Urged priority for the new power plant because all heat and power from the range must come from this facility. They warned that if this facility was not completed before winter, it would be necessary to revert to space heater methods of heating and the unsafe and unsuitable power generator facility.
- (3) Check the probable electrical loads to determine the adequacy of the scheduled wire sizes used throughout the complex. If they were inadequate, as they suspected they were, then replace them.
- (4) Remove the oil heater in the Nike Cajun building and pipe steam heat into the building.
- (5) Improve the personnel passage tunnel to the Nike Cajun building. The tunnel was interrupted because of the road, necessitating an outside detour for personnel using it. That was dangerous in the winter as personnel inside the

<sup>4</sup> Memo for Record, Lt. Col. Kimbrel, 15 August 1962.

<sup>5</sup> Annex No. 1 of "Report of Operations at the RFOAR," 29 August 1962.

## GETTING THE RANGE BACK IN OPERATION

The period between 1 July and 31 October 1962 at CRR was spent repairing existing facilities and equipment, assembling and training personnel, establishing a logistical support system, installing and calibrating equipment and integrating system operations. These activities pertained to the new launch complex and were in addition to the rehabilitation work being done on the facilities damaged by fire in February 1961. With the heavy workload and the shortage of manpower, the 1 November 1962 operational deadline loomed all too close.

Once the physical turnover of the Churchill range was complete, OAR immediately found itself face to face with several very pressing problems. In most cases, these were not problems which could be gradually worked out, but ones which needed an immediate solution. First among them was the general condition of the range. Range facilities were very meager and in an advanced state of disrepair. Discrepancies, such as hazards and unsafe conditions, were conspicuous throughout the range head. It was concluded that a great deal of additional effort, over and above that then being expended, would be necessary during the remainder of the summer season if the OAR range program was to be completed as planned and on schedule.<sup>1</sup>

Another problem was that of support. Previously the U.S. Army provided a considerable amount of support to the numerous agencies at Fort Churchill. This support ranged from minor loans of equipment for short periods of time to services valued at many thousands of dollars. The Air Force, on the other hand, would be unable to maintain that level of support because of the nature of its operation. Not only

that, but the OAR detachment itself would need various types of support from the Canadians--support, such as helicopter service, which the U.S. Army took care of itself.

The most pressing problem in some respects was construction at Fort Churchill. It had to be coordinated with the Eastern Ocean District Engineers, who were supervising it, and with PAA officials, who would administer the range. Not only in matters of construction, but later in administrative matters, PAA would play a big part in OAR range management plans. Coordination and understanding with PAA officials, therefore, was absolutely essential.

In addition to the construction problem, there were many others. Not to be overlooked were the safety aspects of the range and the implementation of a plan to include all of those aspects. Although not of a pressing nature, OAR/SAC relations also had to be taken into consideration as there was a small SAC unit (3949th Squadron) located there. The problem of data reduction would eventually have to be faced, but not for the moment. It was necessary to get the range in working order first, and in that connection, problems more pressing than data reduction demanded immediate attention.

Insofar as new construction was concerned, the Area Engineer for Eastern Ocean District (EOD) informed OAR representatives that special plans and specifications had already been prepared for the procurement of foundation materials for the block house, hazardous assembly building, and the launcher buildings. Specifications had also been prepared for the procurement of the boom launcher. Contract plans and specifications had been issued. Carter Construction had already procured and delivered to the job site a portion of the foundation material (lumber, cement

<sup>1</sup> Annex No. 1 of Ltr, RRF, Ft. Churchill to Hq OAR, Subj.: "Report of Operations at the RFOAR," 20 July 1962.

and reinforcing steel). Additional material was enroute. All the required equipment for that phase of construction was on the job site, with the construction camp, quarters, messing facilities and field offices established. Site work and grading at the locations to be occupied by the block house, hazardous assembly building, launcher building and personnel and missile tunnels were already under way. Construction of foundation forms was nearly complete. Placing these forms and pouring the concrete foundations at the block house site began soon afterwards.<sup>2</sup>

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<sup>5</sup> Annex No. 1 of "Report of Operations at the RFOAR," 29 August 1962.

buildings probably would be forced to go outside insufficiently dressed. As the doors sometime stuck because of snow and cold, personnel could be exposed to the weather an unduly long time. (Although this would probably be only a matter of minutes at most, it must be remembered that exposed flesh will freeze in 1 minute when the wind chill factor is 2000, a not uncommon condition at Churchill.)

- (6) Delete the gib cranes on the block house and operation's building as impractical. (As it turned out it was too late to do that, but experience showed that the mobile cranes were not always available when needed so the gib-cranes were useful after all.)
- (7) Make provisions beforehand for the many existing electrical installations that will require power connections when the new power facility is completed.

Another improvement called for by OAR had to do with range installation policy. In the past range users had been allowed to bring, install, and, upon completion, partially remove various types of instruments and varying lengths of wiring in connection with their shots. The result was that after each shot the user removed the useable portions of wiring and instruments and left everything else just where it was. By the time OAR assumed management of the range, untold millions of feet of various types of cable and wire were either buried in the ground or lying around loose. No drawings or plans existed showing the schematic layout of the wiring, so it was pure guess work as to the origin, use or future application of that material.

OAR considered the chaotic range conditions resulting from this practice intolerable. For the future a policy was established whereby users requiring special instrumentation would provide the range with the necessary equipment and advisory personnel. OAR's contractor personnel would install the equipment as required and initiate the necessary engineering drawings and effort to assure OAR that the equipment used would fit into a logical and reasonable instrumentation pattern. Once

the equipment was installed it would remain the property of the range. Range personnel would not have time to disassemble equipment or dig up cable, only to install the same type of instruments and cable for another experiment later. The only exceptions to that rule would be if instruments could be removed without causing a major disruption of the whole pattern or in the case of instruments which were of a rare type or of no further value to the range.

Another problem was the matter of range visits by potential range users. While these visits were welcomed as necessary and essential as far as understanding and cooperation between the two parties was concerned, the CRR staff felt that the range users were usurping some of the rights of the range operator. CRR representatives maintained that the users' task was to present their requirements for range facilities and to provide any and all guidance needed to assist in providing the services expected. In other words each user presents his problem and the operator determines the solution. As far as OAR was concerned there was no need for the user to come to Churchill with the idea of interviewing personnel to determine their professional qualifications or the status of the range's equipment. The responsibility for these evaluations belonged to the range commander.<sup>6</sup>

Yet another disturbing factor was the absence of any written authority regarding a command destruct system for the range. Because of the potential danger to life and property, OAR was determined that an official policy on the matter should be worked out between the Canadian Army authorities and OAR.<sup>7</sup>

One other factor which gave some concern at first, but was taken care of easily, was the matter of transferring GMD (metro-radar) equipment from its location at the base camp to the range head. The U.S. Weather Service, however, wanted the GMD to be retained by the Canadians and in its

<sup>6</sup> Ibid.

<sup>7</sup> Ltr., Col. Flicek to Actg Cmdr, Ft. Churchill, subj.: "Command Destruct Systems," 9 August 1962.

present location, even though it was Rocket Facility equipment, because of existing international agreements on sharing weather information. OAR representatives felt a definite need for GMD equipment at the range head, even though they could appreciate the U.S. Weather Service's problems in the matter, so it was arranged that OAR would obtain additional GMD equipment for its own use.

By the middle of August considerable progress had been made insofar as range head construction was concerned. Forms were in place for the roof and the remainder of the exterior walls of the blockhouse. Crews were continuing the compacting of non-frost susceptible fill material for the base of the personnel passageway. Culverts were already installed and 240 feet of concrete slab was poured. The concrete walls of the hazardous assembly building were poured to one and one-half feet above floor level. Placing and compacting non-frost susceptible fill material at the sites of the launcher building and missile passageway continued. At the site of the heat and power plant the evacuation for footings was completed and the concrete bases for those footings were already poured. Stripping of frost susceptible material with dozer and hand labor was underway at the location picked for the non-hazardous operations building.<sup>8</sup>

Already, though, there was some concern on the part of OAR representatives that the proposed Beneficial Occupancy Date for the new construction might not be met.<sup>9</sup> A representative from Defense Construction Limited (DCL) had informed the Eastern Ocean District Engineers that the Churchill facility would not be ready in its entirety by 1 November 1962. DCL proposed a 1 November BOD for the launcher building, block house and hazardous assembly building; a 15 November BOD for heating and power, and a 1 December BOD for the operations building.

August, generally, was taken up with a multitude of items, all tied in with readying

the range for its 1 November reopening. Various items of equipment, both from the range head and the instrumentation sites were checked out and repaired where necessary. A request was forwarded to Hq USAF for \$1 million toward a joint Canadian/US hard line communications network. Actual installation would be accomplished by the Canadians. Also in the communications field was a request for a mobile communications system study from PAA/RRF. The proposed system would serve a two-fold purpose. First, it would serve as a source of communications with all vehicles operating in the Fort Churchill RRF complex. Second, it would serve as an emergency back-up system in case of failure of the primary communications network.

By mid-September the Carter Construction Company representatives furnished OAR with what was considered an overly-optimistic report on possible joint occupancy and completion dates for the various range head buildings. The Carter Construction report gave a completion date of 1 November for the blockhouse, the boom launcher building, the hazardous assembly building and the Cajun assembly building. The connecting tunnels to the latter building, as well as the missile and personnel tunnels were to be ready for joint occupancy on that same date, with a completion date of 15 November. November 1st was also the joint occupancy date for the power and heating plant and the instrument room of the non-hazardous operations building. Completion dates for these two were scheduled for 1 December.<sup>10</sup>

While pleased with the rapid progress Carter Construction was making, OAR representatives pointed out that the dates were based on almost perfect construction weather, precise equipment delivery schedules and no unforeseen major obstacles. This was too much to hope for, especially for the Fort Churchill area. Even if the schedules were met, in the majority of the cases OAR would not be able to enter the buildings in sufficient time to install the

<sup>8</sup> Annex No. 2 of "Report of Operations at RFOAR," 29 August 1962.

<sup>9</sup> Memo for Record, Lt. Col. Kimbrel, 15 August 1962.

<sup>10</sup> Command Annex, "Rocket Facility Progress Report No. 4," Period 15 August to 15 September, Rocket Facility, Fort Churchill, Manitoba, Canada, 15 September 1962.

equipment necessary for a 1 November operational date. Therefore OAR was of the opinion that the plan for rehabilitating the old facility was of greater importance than previously anticipated.<sup>11</sup>

The rehabilitation program for the old launching facility to produce an operational range on 1 November was on schedule as of the middle of September. OAR personnel applied all efforts to assist PAA in jointly achieving the goal. The radar site was capable of operating as a system, with the overall station about 90 percent complete. All three radar units were in operable condition as were the three plotting boards. The only work remaining was the installation and replacement of previously ordered parts and a complete alignment of the radar system. The three REAC computers were operational also, but the Automatic Data Recording System was still to be checked out.

The communications system was approximately 70 percent complete, with various systems checks planned for mid-September. At the frequency monitoring site a minimum of one piece of each type of equipment was in operational condition to support other instrumentation operations scheduled for the end of September. Although the overall capability of the station was about 70 percent of normal operation, the expected receipt of various components (already on order) would bring the station to 100 percent of its capacity.

The operational capability of the timing system was about 60 percent. Systems checks were initiated in late September. The overall DoVAP system was 40 percent operational. The transmitter site located at the radar site and the receiver at the Twin Lakes site were re-outfitted in September. Airborne receivers for the SARAH system were relocated in the helicopters. At that time the system was 70 percent operational. Systems checks for SARAH were held in September also. All microphone equipment of the SOTIM system was checked and reinstalled during the last half of September. The telemetry ground station was 90 percent operational and

was capable of supporting tests. A systems check in late September brought it up to 100 percent operational readiness.<sup>12</sup>

By mid-September all of the U.S. Army personnel had departed, with the exception of the Corps of Engineer's Area Engineer, who was responsible for supervising the completion of the reconstruction work on the launch sites. Rehabilitation of the old range head buildings, as well as those at outlying sites, was proceeding at a fairly rapid pace. In the old blockhouse, most of the electrical modifications were complete and inside rehabilitation (installation of doors, electrical conduits and receptacles for communications, repair of water leaks, etc.) was under way. In the power house all the electrical equipment including generators was removed and the old wooden floor replaced by a concrete floor and foundation wall. The only task remaining was the reinstallation of the power generator equipment. The Nike Cajun building was modified so a new launcher mount could be installed. Besides that the building was generally renovated--removal of the front doors for a building addition and the launcher for repair, pouring a concrete slab and cleaning out the old debris left in the building and nearby tunnels. Furnaces, heaters and fuel tanks were removed from the Nike Cajun assembly area and tunnel in preparation for the installation of steam heat. In fact, a general clean-up of the entire range area was carried out over a period of several weeks. A number of temporary buildings were removed (as was the old kitchen building) and thousands of feet of communications and electrical cable, some of which could be salvaged, were gathered up.<sup>13</sup>

Considerable rehabilitation of the rooms and equipment was accomplished at the radar site. Rehabilitation work was in progress at the frequency monitoring site also, four concrete antenna slabs having already been poured. Work was to start at the Digges Siding site sometime during

<sup>12</sup> Command Annex, "Rocket Facility Progress Report No. 4," Period 15 August to 15 September 1962, Rocket Facility, Fort Churchill, Manitoba, Canada, 15 September 1962.

<sup>13</sup> *Ibid.*

<sup>11</sup> *Ibid.*

September. At the Twin Lakes instrumentation site the electrical system was modified to comply with the electrical codes. A furnace was installed in the generator building to replace the space heater system formerly used and the ceilings of both buildings rebuilt and insulated, the roofs repaired.

Construction was moving ahead on the new range head facilities, but with the usual delays in shipments of vital materials, work was running 7 to 10 days behind schedule. Carter Construction completed pouring the concrete walls and the first roof slab of the new blockhouse. Approximately 80 percent of the concrete wing walls of the hazardous assembly building were poured and the form work and reinforcing steel for the remaining concrete work were erected. Outside footings, foundation wall and launcher foundation for the launcher building were also poured.

At the site of the new heat and power plant the footings, pump pit, foundation wall and generator foundations were all poured. The same could be said for most of the foundation wall, interior footings and columns and the floor slab in the east wing of the non-hazardous operations building. Insofar as the passageways are concerned, about 80 percent of concrete slab had been poured for the personnel passageway, and insulation, wallboard and metal roofing and siding were being installed. In the missile passageway 280 feet of concrete was poured while the wall and roof framework was being erected.<sup>14</sup>

The OCG met again in mid-September and conducted further discussions around the progress already made at Churchill and what could be done to expedite matters so the rate of progress could be stepped up. The OCG members also discussed the possibility of lifting restrictions against firing liquid-propellant rockets at the Churchill range. Both the U.S. Navy and NASA had indicated a desire to conduct tests with the liquid-fueled Aerobee rocket. Although the OCG had no objections to such

a change, no decisions were made in the matter at that time. It did endorse the 1 November reopening date for the rehabilitated range. The designation of the range was discussed both during the meeting and afterwards, the group finally recommended changing the name of the facility to the Churchill Research Range (CRR) on 1 November, to coincide with the reopening ceremonies. Several other names were considered, but this one was the only one acceptable to all the members.<sup>15</sup>

By mid-October Colonel Flicek had successfully completed wage scale negotiations with Colonel Galloway, the commander of Fort Churchill. These negotiations went back to early September when proposals for an incentive pay system for PAA employees had been placed before Colonel Galloway. At that time Colonel Flicek discussed the previous local wage agreements and the reasons for the requested departure from those agreements. Mr. Straughan of PAA gave a detailed explanation of the incentive system to Colonel Galloway. Generally, the proposed wages associated with the PAA incentive scheme were within the Canadian brackets and only in a few cases were they above. The cases where higher wages to PAA employees were proposed were backed up with such arguments as lack of stability in PAA employment and the associated hardships encountered at remote assignment locations such as Churchill.<sup>16</sup>

Colonel Galloway, personally, was very receptive to the proposed incentive scheme, but some Canadian Army representatives were concerned about a possible proselytization of their employees by PAA. Colonel Flicek reminded them that it had not happened in the past and he assured them that it would not happen in the future. Admittedly, all concerned on the Canadian side were quite pleased with PAA's past hiring performance in the Fort Churchill<sup>17</sup>

<sup>15</sup> Minutes of the 9th Meeting, OCG, 12 September 1962, Fort Churchill, Manitoba, Canada.

<sup>16</sup> Command Annex, "Rocket Facility Progress Report No. 4," Period 15 August to 15 September, Rocket Facility, Fort Churchill, Manitoba, Canada, 15 September 1962.

<sup>14</sup> Operations Annex, "Rocket Facility Progress Report No. 4," Period 5 August to 15 September 1962, Rocket Facility, Fort Churchill, Manitoba, Canada, 15 September 1962.



**Nike Cajun and Launcher, Ready for Firing**



**Canadian Black Brant Being Fired from the Universal Launcher**



area. As a result of the wage scale negotiations, Colonel Gallaway not only accepted OAR's proposals for initiating an incentive system for PAA employees, but he also approved OAR's various requests for deviations from the Canadian pay scales in effect at Fort Churchill.<sup>17</sup>

As the last week in October 1962 rolled around, work on both the rehabilitation of the old launch site and the construction of new facilities was moving along at a rapid pace. The old launch site was 85 percent complete and the prospects for meeting the 1 November range reopening date were good. This applied, of course, only to the blockhouse, powerhouse and Nike Cajun launcher building as they were the only buildings of the old range head that would be used until the new construction was completed. Other installations which would be needed for actual rocket firing were the Twin Lakes instrumentation site (97 percent complete at the time), the radar site (nearly complete), and the Digges Siding instrumentation site (50 percent complete).<sup>18</sup>

In the new range construction program, the concrete roof of the blockhouse had been completed and mechanical and electrical items as well as interior partitions were being installed. The concrete floor of the hazardous assembly building was finished and the metal siding was being put on the structural framework. Structural steel, including the movable roof, was

nearly erected and the metal cladding was already in place on the launcher building. The heat and power plant already had its two boilers and four diesel-generators in place as well as the exterior diesel tanks. All exterior metal cladding was in place and work was progressing on interior walls, piping and electrical items. At the non-hazardous operations building all outside framing and the plywood exterior were completed. Roofing was almost complete and work was progressing on interior partitions, insulation, ducting and electrical items. Outside fuel tanks were in place but not connected. Mechanical and electrical items were being installed in the Nike Cajun building also. Excavation was completed and the footings poured for the relocation of the Black Brant launcher. Both the personnel and missile passageways were complete externally, but still needed some insulation, piping and electrical items. Ninety percent of the road network was completed.<sup>19</sup>

A final push the last week in October and the rehabilitated blockhouse, Nike Cajun launcher and the hazardous assembly building were ready for the 1 November reopening. After all the planning and hard work, however, the elaborate opening ceremonies had to be greatly curtailed. A severe snowstorm moved in, reducing visibility to almost zero. Opening ceremonies were held on schedule though, with Major General Don R. Ostrander, OAR Commander, attending. Despite the swirling snow, the ceremonial ribbon was cut, formally reopening the range under Air Force management. The rest of the ceremony was held inside the DNRL building. Weather conditions also forced the cancellation of the special rocket firing scheduled for the opening ceremonies. The range had already been initiated in that respect, however, as

<sup>17</sup> Command Annex, "Rocket Facility Progress Report No. 4," Period 15 August to 15 September, Rocket Facility, Fort Churchill, Manitoba, Canada, 15 September 1962; Command Annex, "Rocket Facility Progress Report No. 5," Period 15 September to 15 October, Rocket Facility, Fort Churchill, Manitoba, Canada, 15 October 1962.

<sup>18</sup> Ltr., OAR (Col. Ebbeler) to Hq USAF (AFRDR-AS), Subj.: "Report of Operations at the Rocket Research Facility," 8 November 1962, (See Atch No. 1, showing rehabilitation status as of 22 October 1962).

<sup>19</sup> *Ibid.*

the first rocket firings on the CRR under the auspices of the U.S. Air Force were conducted on the night of 30 October. Two Arcus Robins were fired, both flights being successful. Some of the range instrumentation systems were exercised at that time also.

The first scientific payload raised to altitude by rocket power from the newly activated range was launched at 2359 hours

(local time), 15 November in support of a sodium vapor grenade experiment for the Goddard Space Flight Center (GSFC). A Nike Cajun was used for the experiment. That launch marked the beginning of a period during which range activities and accomplishments steadily increased until the highlight of the period--the 20 July Operation PROBE HIGH in connection with the solar eclipse.

## ROUNDING OUT THE FIRST YEAR

Despite the problems of winter, which are ever-present to an extreme degree at Fort Churchill, work was pushed along as fast as possible on the new launch complex. By 6 December, OAR could report work on the blockhouse as complete with the exception of heating and ventilating equipment, air conditioning equipment, blast doors and observation windows. The hazardous assembly building, likewise nearly complete, needed only heating and ventilating equipment and the electrical work.

While a great deal of progress had been made there was still considerable work to be done on the launcher building, heat and power plant and the non-hazardous operations building. Most of the work to be done was inside the buildings. Besides installation of heating and ventilating equipment and electrical work, there were generators to be put in operation, painting, laying tile on the floors, etc. In both the personnel and missile passageways there still remained some work, such as weatherstripping, painting, electrical work, installation of unit heaters and cable trays, etc. Cold weather had forced the cessation of work on the road but it was 98 percent complete. Heating and ventilating still remained to be completed in the Nike Cajun building. The explosion-proof condensate pump had still not been delivered, but it was possible to operate without it for a short time at least. Except for installation of the electric panel and final testing the Black Brant launcher was relocated.<sup>1</sup>

By mid-December the blockhouse was nearly ready for final inspection. Some minor last-minute work still remained to be done on the heating, ventilation and air conditioning equipment and the observa-

tion windows. The hazardous assembly building, launcher building, heat and power plant, and the missile passageway were all expected to be ready for final inspection during the latter half of December. Final inspection had been held at the non-hazardous operations building, and was even then being held at the Nike Cajun building. All was in readiness for the final inspection in the personnel passageway and at the new Black Brant Launching site. Adverse weather conditions were still prohibiting work on the roads in the new area.<sup>2</sup>

Insofar as user activity was concerned, the period from mid-December 1962 to mid-January 1963 was a very inactive period for the range. OAR representatives took advantage of that period by asking the range contractor to prepare plans on how the new launch complex could best be used and to draw up a schedule for moving into the new complex. One objective of the plan was to consolidate the majority of the range instrumentation in the new operations building.

Most of these instrumentation systems were relocated in the new complex and the check-out processes were underway, and by 15 January, the CRR was almost ready to move into the new range facilities. No activity was started in the new blockhouse as there were still some items of equipment undelivered and they probably would not arrive before the 1st of February. All of the new buildings and equipment of the new launch complex, with the exception of the launcher building and associated equipment, were accepted from the Eastern Ocean District Engineers. Refusal to accept the launcher building was based on the many discrepancies evident in both the building

<sup>1</sup> Ltr., OAR (RROO) to Hq USAF (AFRST-SC), Subj.: "Report of Operations at the Churchill Research Range," 6 December 1962.

<sup>2</sup> "CRR Progress & Status Report No. 7," 16 November to 15 December 1962, CRR, Ft. Churchill, Manitoba, Canada, 15 December 1962.

and the launchers. It was estimated at the time that OAR would be able to occupy the building some time in February.<sup>3</sup>

As it turned out, the new launch building was finally accepted on 7 March. This event was followed up on 15 March with the first rocket firing "dry run" from the new building. The first rocket was fired from it on 20 March. The test vehicle was a Black Brant I and the launch was accomplished in support of a Canadian Armament Research and Development Establishment Nitric Oxide Jet Seeding program. The countdown was scheduled to begin at 1630 (Central Standard Time), with the scheduled firing at 2100 hours. There were two holds during the test countdown. The first hold was for 31 minutes and was caused by too much auroral activity in the seeding area. The second was a momentary hold which occurred at T-60 seconds and was necessary to allow the Pad Safety Officer and the Launch Superintendent to reach the blockhouse fallback area.

The new launch bay and launcher operated satisfactorily and all range instrumentation performed as expected. Unfortunately, the experiment aboard the test vehicle was unsuccessful because of the malfunction of an airborne timer. The timer malfunction precluded operation of the nosecone separation mechanism and the nitric oxide seeding did not occur.<sup>4</sup>

Problems during this period were not confined to range rehabilitation and construction. The Canadian Army, in the past, supported the CRR with quartermaster and ordnance equipment. These included such items as beds, refrigerators, fire fighting equipment, chairs, tables, etc., all items normally used to equip the OAR buildings at the base camp, as well as some of the range head and instrumentation site facilities.

<sup>3</sup> "CRR Progress & Status Report No. 8," 16 December 1962 to 15 January 1963, CRR, Ft. Churchill, Manitoba, Canada, 15 January 1963.

<sup>4</sup> Command Annex, "CRR Progress & Status Report No. 11," Period 16 March to 15 April 1963, CRR, Ft. Churchill, Manitoba, Canada, 15 April 1963. See also Summary of Activities Annex (Test #83), same report.

Continuation of this support was a matter which had been under discussion with Canadian Army representatives for several months. The initial position taken by the Canadian Army was that they wanted all of their stores, or equipment, returned since they considered that they had no responsibility for providing these items. Furthermore, their interpretation of the Administrative And Finance Agreement Between The US And Canada (The document was still in draft form at the time. For final April 1963 version see Appendix D) was that they had no responsibility to furnish "stores" of any sort with the exception of some fire fighting equipment at the base camp. Implementation of that interpretation would mean the direct substitution of American items for Canadian equipment. OAR felt that as long as the CRR was a joint Canadian-U.S. undertaking, the efforts of both countries were required. This meant, according to OAR logic, that the Canadian Army should continue to support the range with the same type of logistic effort it furnished in the past.<sup>5</sup>

OAR and PAA representatives held a meeting with the Canadian officials concerned on 1 February. The result was a decision by Colonel Galloway, Canadian Army commander at Fort Churchill; which agreed with OAR's expressed opinion on the matter. Colonel Galloway also agreed that other stores, which might be required as a result of the aforementioned agreement, would be provided if the Canadian Army physically had such stores available at Fort Churchill. He reminded OAR officials, however, that the Canadian Army reserved the right to make the decisions as to which stores were required.<sup>6</sup>

<sup>5</sup> Command Annex, "CRR Progress & Status Report No. 9," 16 January to 15 February 1963, CRR, Ft. Churchill, Manitoba, Canada, 15 February 1963.

<sup>6</sup> Ltr., Canadian Dept. of National Defence, Army (Col. Galloway) to Cmdg Ofcr, OAR Det #2, Ft. Churchill, Manitoba, Subj.: "Distribution of Stores," 1 February 1963 (See also Attachment A, "CRR Progress & Status Report No. 9," 16 January to 15 February 1963, CRR, Ft. Churchill, Manitoba, Canada, 15 February 1963).

## AEROBEE LAUNCH COMPLEX

On 21 February 1963, representatives of the Corps of Engineers, Eastern Ocean District, met with OAR representatives at Fort Churchill to discuss range construction problems and an inspection criteria for a building acceptance program. During this discussion the subject of the rehabilitation program for the Aerobee launch complex came up.

The question of what to do about the Aerobee tower rehabilitation actually went back to about mid-September 1962 when OAR concluded a study concerning the Aerobee launching facility. It was determined from that study that the whole complex was in very poor condition and would require considerable effort to place it once again in an operable condition. OAR officials felt that if there was a requirement for about one Aerobee launching a month, and, if these launchings were spread over a prolonged period of a year or more, the launch should be restored to such a standard that reliable operations with no safety waivers could be assured. The cost of such a project was estimated at about \$500 thousand. A limited facility that could, with safety waivers, be used for occasional firings would cost about \$300 thousand.<sup>7</sup>

DDR&E spokesmen had specified that only solid propellant vehicles would be launched from the RRF. OAR representatives felt that a solid basis for reconsideration of that decision would be necessary before DDR&E would consider negotiating it. Such a basis would probably be:

- (1) Convincing reasons that an Aerobee capability was necessary or could accrue savings.
- (2) A statement from USAF safety authorities as to what modification was required.
- (3) Cost of such modification.
- (4) Source and availability of the necessary funds.<sup>8</sup>

<sup>7</sup> Command Annex, "Rocket Facility Progress Report No. 5," 15 September to 15 October 1962, Rocket Facility, Fort Churchill, Manitoba, Canada, 15 October 1962.

<sup>8</sup> Minutes of the 9th Meeting, OCG, 12 September 1962, Ft. Churchill, Manitoba, Canada.

NASA representatives, also concerned in this matter of course, asked if the range was funded in such a manner that the cost for this new requirement could be absorbed by the range, if submitted in sufficient time for it to be included in the annual funding cycle. This was not possible. Besides paying half the cost of operation of the range, NASA, in the case of restoration of the Aerobee facility, would be expected to provide all the funds as it was the requiring agency.<sup>9</sup>

Finally in early October 1962, OAR representatives made inquiries of Hq USAF concerning the future of the Aerobee complex. Mentioning that the OCG had discussed the DOD policy of no liquid rockets at the CRR, OAR spokesmen pointed out that the OCG had no objections to a change in that policy. NASA, AFCRL and the Office of Naval Research (ONR) were all showing a considerable amount of interest in the Aerobee launch complex. In totaling up those agencies' estimates on possible rocket firings, it appeared that there would be a requirement for the firing of about two Aerobee rockets per month over a possible five-year period. At the request of OAR Detachment #2 at the RRF, Hq OAR representatives approached Hq USAF on the subject. OAR spokesmen stressed that they had no objection to operating the liquid launch facility provided the DOD policy was changed and the potential users would furnish funds for the rehabilitation of the Aerobee complex. OAR, therefore, requested that it be advised of the present DOD policy regarding liquid rockets at the RRF, and if the current policy permitted use of the Aerobee, Navy and NASA would immediately be contacted regarding plans and funds for the Aerobee rehabilitation.<sup>10</sup>

By early December, rehabilitation design and costs of the Aerobee launch complex were being developed by the Eastern Ocean District Engineers. The results of that

<sup>9</sup> Ibid.

<sup>10</sup> Ltr., OAR (Col. Ebbeler) to Hq USAF (AFRST-SC), Subj.: "Aerobee Launcher at the RRF," 8 October 1962; Command Annex, "Rocket Facility Progress Report No. 6," 16 October to 15 November 1962, CRR, Fort Churchill, Manitoba, Canada, 15 November 1962.

EOD evaluation and the availability of funds were to be considered when determining further action on the project. OAR representatives reminded Hq USAF at that time, that prior to initiating any action to start the rehabilitation a DOD waiver on the previous restrictions on firing liquid rockets at the CRR would be required.<sup>11</sup>

On 13 December 1962, a CRR users' meeting was held in Washington, D.C., in an effort to develop a user criteria for redesigning the Aerobee launching facilities. The reason behind the meeting was to afford the users the opportunity to provide the designers with the required specifications during the early phases of the planning activities so that a smooth and well-coordinated rehabilitation would be possible from the very beginning. The meeting accomplished the purpose for which it was called.<sup>12</sup>

The Engineers' Eastern Ocean District, in its negotiations with its Canadian contractor (DCL) on the Aerobee rehabilitation project, was required to provide various supporting services. Those services could only be provided by OAR Detachment #2. In January 1963, Colonel Flicek, CRR Commander, and Captain Thomas P. Nack, Area Engineer for the EOD, came to an agreement whereby OAR Detachment #2 would provide DCL, at no cost, with support facilities as previously mentioned. These would include such items as snow removal on the Fort Churchill launch area road, electric power, water and steam from the existing facilities, and transportation to the launch area.<sup>13</sup>

Further discussions concerning the Aerobee complex were taken up at the OCG meeting in Washington, D.C., on 20 March 1963. NASA representatives stated that they had written to the DOD offering

to fund the entire cost of rehabilitating the Aerobee launch tower and associated equipment and facilities. They emphasized the urgency of the work in order to meet the goal of the 20 July solar eclipse launchings. The DOD had assured them of prompt action.<sup>14</sup>

One question which immediately arose was whether waivers would be permitted for the solar eclipse rocket probes if the rehabilitation of the Aerobee tower was not 100 per cent complete. The Chairman of the OCG stated that the existing DOD policy still was not to operate under waivers. He suggested that the priority of work be allocated to those tasks directly associated with range safety as opposed to civil engineer-type safety requirements. All at the meeting agreed that should a need arise to request launch safety waivers, it would be necessary first of all to obtain the permission of the Commander of Fort Churchill in accordance with the government-to-government agreement and the Canadian Chief of Staff Committee's "Statement of Policy on Fort Churchill." It was further agreed that OAR would review the status of the Aerobee complex in mid-June and if any problem existed at that time, OAR would report the matter to the Chairman of the OCG not later than 20 June.<sup>15</sup>

The official notification permitting the rehabilitation of the Aerobee launch facility, along with the requirement for new construction, reached the CRR on 16 April. The notification also contained instructions stating that an Aerobee launching would be required on 20 July.

The terms of the Aerobee rehabilitation notification left OAR with only one alternative--to conduct the rehabilitation in two stages. The first stage would consist of only essential and emergency actions necessary to fire the Aerobee on July 20th. The overriding emphasis when evaluating priorities for work orders would be placed on contribution to a successful firing and range safety. The second phase would consist

<sup>11</sup> Ltr., Hq OAR (Col. Carson) to Hq USAF (AFRST-SC), Subj.: "Report of Operations at the Churchill Research Range," 6 December 1962.

<sup>12</sup> Command Annex, "CRR Progress and Status Report No. 8," 16 December 1962 to 15 January 1963, CRR, Ft. Churchill, Manitoba, Canada, 15 January 1963.

<sup>13</sup> Memo For Record, Lt. Col. Flicek and Capt. Nack to Area Engineer, EOD, Ft. Churchill, Manitoba, Canada, Subj.: "Contractor Support for the Aerobee Rehabilitation Project," 24 January 1963.

<sup>14</sup> Minutes of the 10th Meeting, OCG, 20 March 1963.

<sup>15</sup> Ibid.

of completing the launcher rehabilitation and constructing the Aerobee operations building. In order to accomplish this it would be imperative that the Aerobee facility be closed to all operations after the solar eclipse shots in July, so that the work could be completed during the summer construction period. In connection with this completion, OAR emphasized that any planned delays, because of launchings, would have a severe effect on the contract price, as the construction crews would continue to draw their pay irrespective of their utilization.

On 24 April, Colonel Flicek and his staff met with EOD representatives from New York and Captain Nack, EOD Resident Engineer, for the purpose of reviewing the specification drawings for the Aerobee facility. The specifications were approved by the CRR representatives with minor exceptions. Although the range contractor (PAA) objected to the EOD proposal for running overhead power cables and steam lines to the facility, the OAR representatives approved that part of the plan because they considered that the cost of burying these utilities would be very high and maintenance extremely difficult. Furthermore, EOD representatives had especially recommended the overhead plan based on their long experience in Arctic construction.<sup>16</sup>

Carter Construction started rehabilitation work on the Aerobee facility on 1 May. The initial effort was devoted to restoring the electrical equipment and wiring and decontaminating the liquid fuel system. Sufficient work was completed by 10 July to permit Aerobee firings during the month of July.<sup>17</sup>

And as if there were not already enough complications present or developing in the Aerobee rehabilitation program, there appeared still another. For some time the CRR staff at Fort Churchill had been under the impression that a trained Aerobee

launch capability existed in the PAA organization at the Atlantic Missile Range (AMR) and that this capability would be available on short notice to accomplish Aerobee launchings at the CRR. As a result, the OAR staff at Churchill assumed, in the course of its operational planning exercises, that Aerobee launch teams would be provided on a TDY basis.

On 3 May, the CRR staff learned that no PAA Aerobee launch crews were available at the AMR. Not only that, but that approximately \$35 thousand would be required to train a PAA Aerobee launch crew. After carefully considering the PAA proposal to train such crews, the CRR staff rejected the idea. For one thing the crews would not belong to CRR and would be available only on a TDY basis. Then too, the CRR staff foresaw continuing training problems brought about by transfers of personnel, a condition over which it would exercise no control as long as the firing crews belonged to PAA.<sup>18</sup>

Another factor taken into consideration by the CRR staff was the July solar eclipse operation. Because of critical requirements calling for firing eight rockets within 130 minutes, including having three of these in the air at the same time, it was essential that a truly professional and experienced firing crew be available. The CRR staff felt that any PAA crew, in spite of any training given them, could not reach a high enough peak of proficiency in time for the 20 July launchings.

Therefore, CRR recommended to Hq OAR that a professional Aerobee launch team be provided by NASA. It asked that such a team be available to the CRR from mid-June until the end of July. The team would be under the operational control of the CRR range contractor and would have two responsibilities--initially, it would assist in the checkout of the Aerobee facility to assure successful and safe Aerobee shots in July, and secondly, it would fire the three Aerobeas scheduled for firing on 20, 22, and 24 July.<sup>19</sup>

<sup>16</sup> Command Annex, "CRR Progress and Status Report No. 12," Period 16 April to 15 May 1963, CRR, Ft. Churchill, Manitoba, Canada, 15 May 1963.

<sup>17</sup> At the end of July the Aerobee launch complex was again to be turned over to the EOD Engineers for completion by mid-November 1963.

<sup>18</sup> Command Annex, "CRR Progress & Status Report No. 12," Period 16 April to 15 May 1963, CRR, Ft. Churchill, Manitoba, Canada, 15 May 1963.

<sup>19</sup> *Ibid.*

On 4 June, Colonel Flicek attended another EOD meeting, this one in New York, to review the specifications for the Aerobee construction program. This meeting, as well as the other reviews of the Aerobee program, was necessary because of the limited funds available for the program. The limitation of funds meant that a great deal of effort was expended in an attempt to fit the construction and maintenance programs into a strict financial ceiling.<sup>20</sup>

Although the meeting did result in a better understanding of some of the CRR's requirements, the members were not able to conceive any plan whereby costs could be further reduced. It was felt on their part that it would be impossible to make additional cuts in the program and still maintain a safe and reliable facility. Colonel Flicek pointed out that any further reductions would really represent false economy in the long run, for preventative maintenance and restorative actions cannot be neglected. To allow this neglect would only mean higher restorative costs later. Then too, it was possible to get the work done by contract at that time (June 1963). To do the job later would probably mean accomplishing it through sub-contract or hiring an additional work force. Either method would mean higher costs and possibly a less experienced labor force.<sup>21</sup>

The ultimate goal was to develop an independent Aerobee launch capability for CRR. It was planned to do this by conducting on-the-job and cross-training exercises within CRR firing crews. To carry out such a plan, however, it was estimated that three additional crew members would be needed to augment the CRR firing team. These three additional crewmen would then have full time responsibility for maintaining the Aerobee launch facility once it was completed and turned over to the CRR as an operational installation. To fully implement this plan it would be necessary to bring another NASA Aerobee launch team to the CRR later in the fall,

as July would be taken up with various rocket firings and there would be no time for the envisioned training.

The additional crew members were obtained and the CRR began the development of its own Aerobee launch capability. Mr. R. Patracik of Space General arrived in June to handle the four Aerobee firings starting with the 20 July shot. Although the Aerobee program was late in getting started for numerous administrative reasons, sufficient work was completed by 10 July to permit Aerobee firings during the month of July.

#### OPERATION PROBE HIGH

Planning for Operation PROBE HIGH, the mass rocket launching exercises scheduled for the 20 July 1963 solar eclipse, was launched in April. NASA representatives and CRR officials held two conferences, one on the 9th of April, the other on the 10th. AFCRL representatives were unable to attend the meeting. During the first portion of the two-day conference, Dr. Smith, a Project Scientist with Geophysics Corporation of America (GCA) explained the objectives of the seven NASA rockets that would be fired during the period of the eclipse. Another rocket, the eighth to be fired during the course of the eclipse, was to be fired by AFCRL.<sup>22</sup>

After a thorough review of those objectives that NASA hoped would be accomplished during the solar eclipse, the conferees discussed the methods that would be used to accomplish the mass firing exercise. They also assigned various portions of the preparations for the solar eclipse shots to the Air Force, PAA Range Contractor and NASA.

Follow-up meetings were planned for 14 and 15 May, with the various agencies reporting the progress made on their assigned actions. Because the AFCRL representatives were unable to attend the meeting, the CRR staff planned to send a

<sup>20</sup> "CRR Progress & Status Report No. 13," Period 16 May to 30 June, CRR, Ft. Churchill, Manitoba, Canada, 30 June 1963.

<sup>21</sup> *Ibid.*

<sup>22</sup> Command Annex, "CRR Progress & Status Report No. 11," Period 15 March to 15 April 1964, CRR, Ft. Churchill, Manitoba, Canada, 15 April 1964.



representative to AFCRL to explain the program planned for the mass launching exercise and to make sure that all phases of the various activities were being coordinated.

A third planning meeting for Operation PROBE HIGH was held on 18 and 19 June. Representatives attended from GCA, NASA, Space General, DRNL and CRR. Action items, proposed operations plans, and user problems were all discussed by the group with various changes recommended.<sup>23</sup>

Some equipment (rocket motors, scientific packages, etc.) were already on hand by this mid-June meeting, with the remainder expected during the following two or three weeks. As space at the range was limited, range users were urged to keep the number of people to a minimum. The range users communications system was discussed at some length. Each range user was to have his own communications net for his particular area of primary concern. In addition, a communications system was to be installed for the outside launchers.

A complete dry run was planned for 13 July, terminating with a Nike Apache launch, but was not actually carried out until 14 July. This launch was the control shot for the Nike Apache tests scheduled for 20 July. The rocket carried instrumentation in the nose-cone to measure electron density and electron temperature by the Langmuir Probe technique and to measure radiation in the ultraviolet and x-ray regions of the spectrum. NASA/Geophysics Corporation of America was in charge of the experiment. The primary objective of the test was to acquire baseline data to which the solar eclipse data could be compared. Even though the vehicle did not achieve the desired spin rate (with resulting degradation of rocket performance), the user was able to obtain a certain amount of usable data.<sup>24</sup>

<sup>23</sup> Operations Annex, "CRR Progress & Status Report No. 13," Period 16 May to 30 June, CRR, Ft. Churchill, Manitoba, Canada, 30 June 1963.

<sup>24</sup> Operations Annex and CRR Summary of Activities Annex 30 June to 31 July 1963. Both from "CRR Progress and Status Report No. 14," Period 1 July thru 31 July, CRR, Ft. Churchill, Manitoba, Canada, 31 July 1963.

To the launcher facilities already available, were added four outdoor launchers constructed specifically for operations planned in connection with the solar eclipse of 20 July. They were located near the outdoor Black Brant launcher just southeast of the blockhouse. These four Nike launch pads were built to accommodate Nike Apache solar eclipse launches. The Nike launchers and associated equipment arrived in mid-June and the pads were ready in early July.

The outdoor Black Brant launcher, which was moved in the fall of 1962 from its old location near the Nike Cajun assembly building to the new location near the blockhouse, was modified so that a Nike Apache could be fired from it also on 20 July. This work was finished around the 10th of July.

Seldom has an event stimulated such widespread and common interest among so many research groups as did the solar eclipse of 20 July. Much of this intense interest stemmed from the fact that the eclipse had a bearing on propagation, ionospheric physics, solar and radio astronomy, and atmospheric processes. During the eclipse scientists took scores of individual measurements from 11 separate locations in Maine, Massachusetts, Canada, and from a KC-135. Churchill itself was a good location from which to observe the eclipse, for it was only 160 miles northeast of the path of total eclipse. During the period of maximum coverage of the solar disk, the sun was 94 percent obscured at the Fort Churchill range and 90 percent obscured at the rocket's apogee.

The role of sounding rockets in obtaining data on the earth's outer atmosphere is unique in that they are ideally suited for work in the intermediate regions above heights attained by balloon-borne experiments and below the orbital paths of earth satellites. They are particularly useful for vertical sampling of the ionosphere. Typical rocket experiments during the past decade have provided valuable data on atmospheric composition, wind shear and turbulence characteristics, electron density and temperature variations, cloud cover characteristics, and the intensity--at a given point

of time--of such phenomena as solar radiation, upper atmosphere neutrons, and earth's magnetic field.<sup>25</sup>

With all the months of hard work, frustration and deadlines that were behind, it at last seemed that Operation PROBE HIGH could be launched as planned. The primary objective of the operation was to study the effects of an eclipse of the sun on electron density, electron temperature and ionospheric absorption characteristics in the ultra-violet and x-ray regions of the spectrum. From the measurements made during the total eclipse, it was hoped that it would be possible to determine whether electrons are destroyed during an eclipse by a process of recombination with positive ions or of attachment to neutral molecules (or atoms) and whether the value of an appropriate coefficient can be determined. This coefficient is at present known only approximately in spite of its fundamental role in the theories of the ionosphere. The solar eclipse provided a unique opportunity to attempt to determine the value of the coefficient absolutely.<sup>26</sup>

Experiments to study those effects were to be conducted by means of eight research rockets, each bearing a scientific payload. They were all to be launched during the period of the eclipse, a time span of approximately 130 minutes (about 1500 hours to 1710 hours). At one time during the operation, three rockets were to be airborne and tracked simultaneously. In order to complete these firings within the scheduled time, some 3000 items of countdown were verified. This intricately complicated sequence of rocket firings included six Nike Apache, one Black Brant IIA, and one Aerobee 150 rocket vehicles. Five of the rockets were launched on the exact scheduled second, two rockets were one second off, and one was two seconds late. This outstanding accomplishment provided the scientific community with an unparalleled opportunity to obtain scientific data relative to the solar eclipse.

<sup>25</sup> Dr. Leslie G. Smith, "Measuring In The Shadow," *Quality Assurance*, May 1963, p. 36.

<sup>26</sup> Operations Plan for Operation PROBE HIGH, Solar Eclipse Launches, CRR, 8 July 1963.

For a few breathless moments, though, it appeared as if all the carefully laid plans for Operation PROBE HIGH were to be ruined because of an errant bush pilot. That would have meant the ruin of \$1 million worth of experiments--and a chance which would not reoccur in the western hemisphere for another 54 years.

A few minutes before firing, a Beaver seaplane rose from Landing Lake near the town of Churchill and flew at low altitude--with agonizing slowness--directly across the firing line. At four minutes before lift-off for the first rocket (a Nike Apache) OAR's range safety officer (Captain W. R. Barrett) switched on the last-minute "hold" button. It made all lift-off buttons ineffective as the count continued in hopes that the yellow-colored seaplane would clear the danger area in time.

At one second before lift-off, with the concurrence of the Canadian safety officer (Major Ken Heans), Captain Barrett pulled the switch down for "go". It was the first time in his two years on the range that he had had to use the switch. It seemed incredible that in all the vastness of the Arctic, a bush pilot had chosen that place and that moment--timed to the split second--to amble over the range.

The pilot had not only disregarded notices to stay away from the range, he had filed no flight plan with the RCAF, and had not contacted the RCAF tower before taking off. Although repeated attempts were made to contact him, he could not be reached on any radio frequency. Range officials took down his registration number, however, and the RCAF filed a charge with the Department of Transport against the pilot of the plane.

With the range clear at last, the first sounding rocket, a NASA/GSFC Nike Apache was fired at 1500 hours to initiate Operation PROBE HIGH. The primary objective of this test and of the other Nike-Apache launches was to measure electron density and electron temperature by the Langmuir probe technique--an adaptation for rockets of electrical equipment developed by Dr. Irving Langmuir (1881-1957) for probing ionized gases--and to measure solar radiation in the ultraviolet

and x-ray regions of the spectrum.<sup>27</sup> Unfortunately the first test was a failure because of a malfunction of the first stage and subsequent non-ignition of the second stage of the rocket vehicle.

The second NASA/GSFC Nike Apache was launched at 1530 hours. The performance of that vehicle was almost identical to the first one. It appeared that the rocket broke up just prior to first stage burn out. This assumption was validated by the loss of the TM signal at plus three seconds, which is one-half second before normal burn out. Consequently, that test was also a failure.<sup>28</sup>

At 1603 hours, the launch crews tried again, this time with the third NASA/GSFC Nike Apache. This shot was the first scheduled firing into the most complete portion of the solar eclipse. Vehicle and payload performance were both excellent. All objectives of the experiment were obtained on this firing.<sup>29</sup>

The fourth shot of the day was AFCRL's Black Brant IIA at 1605 hours. The primary purpose of that flight was to measure ionospheric variables in the D region and lower E region during an auroral absorption event. In that connection the following basic experiments were flown: impedance probes, to determine electron density; retarding potential analyzer to obtain data on electron and ion density and electron temperature; conductivity probe to obtain electron density data; and the use of the absorption technique to obtain electron density information. Secondary objectives of the tests included testing the vehicle flight system of the airborne instrumentation and the determination of test vehicle apogee by using a cosmic ray altimeter. This instrument, however, was only carried in the Black Brant IIA fired by AFCRL on 26 July. The second vehicle was launched as a reference shot so that information obtained from it could serve as a control

point to which the information from the solar eclipse launch could be compared. Vehicle performance of the second Black Brant was excellent, as was instrumentation data with the exception of the radar beacon track. As near as possible, times, launch angles, etc. were duplicated on the two shots. Vehicle and payload performance of the Black Brant launched on 20 July was beyond all expectations. Every facet of the test was completed almost exactly as predicted. On comparing the test results of both rockets a preliminary study of data from the two rockets indicated that all test objectives were accomplished.<sup>30</sup>

Shot number five was the NASA/GSFC Aerobee 150, launched at 1606. The primary purpose of this flight was to measure spectral emission lines in the upper atmosphere as well as a measurement of the sodium concentration. The spectral emission line intensity was to be measured as a function of altitude, thus determining the distribution of certain molecular and atomic species in the upper atmosphere. The rocket carried spectrophotometric instrumentation to measure the absolute intensity of certain spectral features in the far ultraviolet region of the night airglow during and after the eclipse.

Apparent rupture of the solid propellant booster just prior to burn out caused the vehicle performance to be much less than predicted. From telemetry records, it appeared that the rocket flight altitude was disrupted by the booster malfunction and the vehicle was approximating a flat spin at apogee (50 km.). One portion of the experiment was a complete failure, while a limited amount of useful data was obtained from another experiment.<sup>31</sup>

Originally, this test was, like the Black Brant test, to consist of two rockets. One

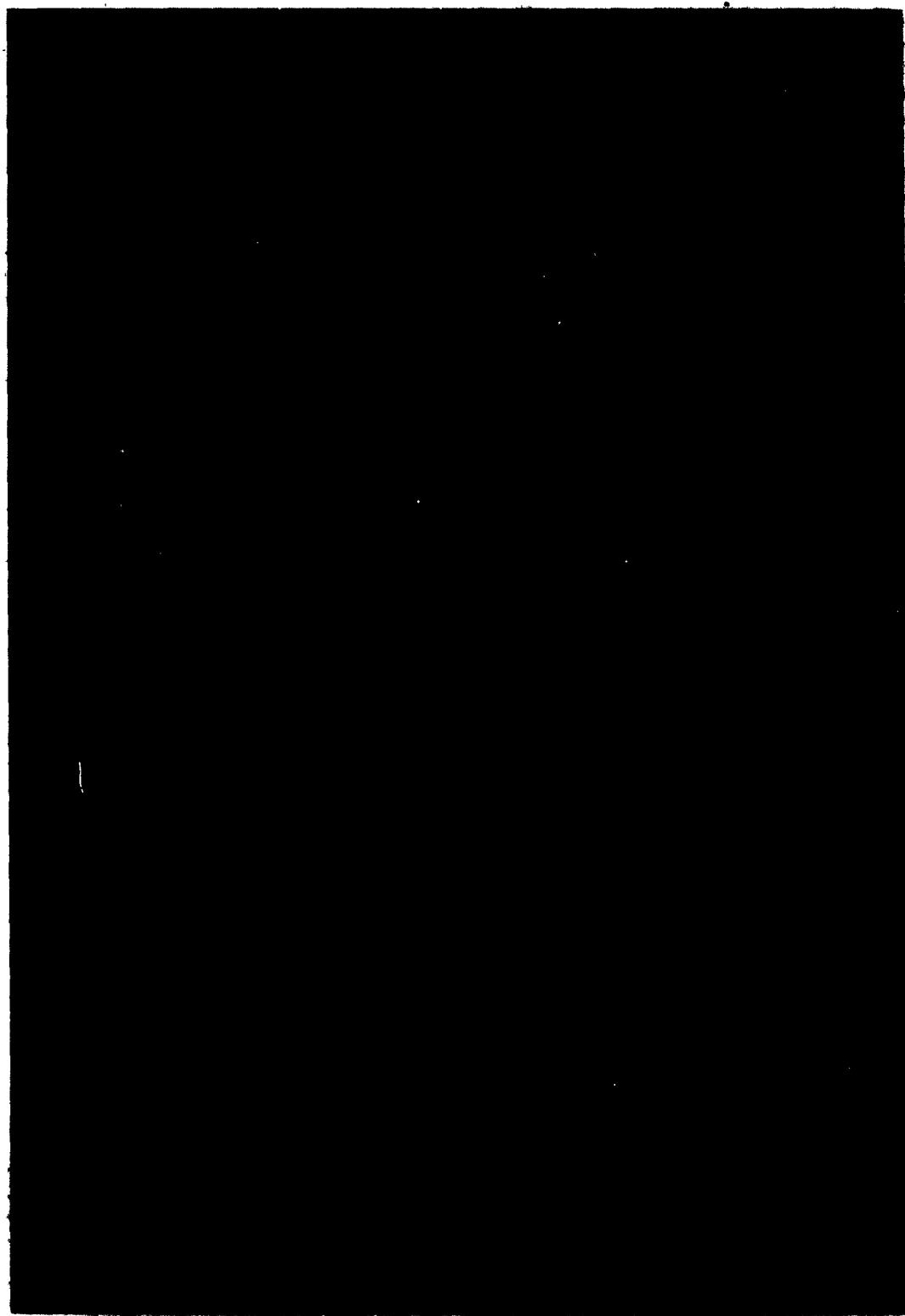
<sup>27</sup> Operations Directive No. 110, Nike-Apache Launch Solar Eclipse Baseline, CRR, 24 June 1963, p. 3.

<sup>28</sup> Operations Annex, "CRR Progress & Status Report No. 14," Period 1 July thru 31 July, CRR, Ft. Churchill, Manitoba, Canada, 31 July 1963.

<sup>29</sup> *Ibid.*

<sup>30</sup> Operations Directive No. 109, Black Brant Launch, Ionospheric Absorption Experiments, CRR, 2 July 1963; Operations Annex, "CRR Progress & Status Report No. 14," Period 1 July thru 31 July, CRR, Ft. Churchill, Manitoba, Canada, 31 July 1963.

<sup>31</sup> Operations Directive No. 114, Aerobee Launch, Special Features of the Far Ultraviolet Region, CRR, 27 June 1963; Operations Annex, "CRR Progress & Status Report No. 14," Period 1 July thru 31 July, CRR, Ft. Churchill, Manitoba, Canada, 31 July 1963.



Aerobee 150 Being Fired from Aerobee Launcher (Operation PROBE HIGH)

was to be fired on the 20th, the other on about 22 July. The partial failure of the first launch negated any necessity for the second.

The Aerobee 150, The Black Brant IIA and the third Nike Apache were all launched within a period of three minutes. All three rockets were in the air and transmitting data simultaneously.

Launches number six, seven and eight were all NASA/GSFC Nike Apaches--#6 was fired at 1613 hours, #7 at 1640 hours and #8 at 1710 hours. Their purpose was the same as for the first three Nike Apaches.

The vehicle and instrumentation performance of the sixth rocket was excellent. It was a perfect flight from the experimenters point of view. In shot number seven the vehicle performance was excellent. Payload performance was not complete because of the failure of the package doors to eject. This malfunction caused the loss of solar radiation data but excellent electron density profiles were obtained on ascent and decent.

The eighth and last vehicle was launched at the end of the eclipse to obtain data for comparison with shots made during the middle of the eclipse cycle.<sup>32</sup>

Despite the failure of some of the vehicles and the resultant loss in scientific data, Operation PROBE HIGH must be judged a success. For the data gathered by the successful probes, properly correlated and interpreted, together with the interpretation of data taken by other researchers, certainly should result in a much better understanding of solar-terrestrial relationships.

#### BALLOON LAUNCHES

Although the emphasis so far in this study has been on the launching of sounding rockets at the CRR, there is another category of user operations at the Churchill range--that is the launching of balloon

flights. Balloon releases were already in progress when the CRR became an Air Force responsibility on 1 July 1962. The first subsequent operation was a balloon flight at 2116 hours (local time), 6 July, in support of experiments under the direction of Dr. F. Meyer of the University of Chicago.

During the ensuing periods of balloon activity--primarily the months of June, July and August of 1962 and 1963--a total of 67 balloons were released in support of a variety of users. Thirty-one of these were in the summer of 1962, the remainder (36) in the summer of 1963.

In general, the various test objectives of these flights were: (1) Detection and continuous monitoring of auroral x-ray activity; (2) Detailed investigations of the spectrum of low energy (15-100 Kev) auroral x-rays; (3) Investigations of neutron fluxes in the upper atmosphere; and (4) To study, by means of cloud chambers, photographic emulsions and scintillation counters, the composition and spectrum of cosmic radiation at high geomagnetic latitude and altitudes up to approximately 140,000 feet.<sup>33</sup>

As with other operations at the Fort Churchill location, many balloon flights had to be cancelled because of adverse weather conditions. Nevertheless, the balloon programs were very successful with 95 percent of the test objectives being met. Balloon operations during the period under discussion were conducted by users at the Goddard Space Flight Center, U.S. Naval Research Laboratories, the Graduate Research Center of Dallas and the Universities of Chicago, Rochester, California, Minnesota and Alberta.<sup>34</sup>

From 15 June 1963 through 8 August 1963, the Churchill range provided support to the Office of Naval Research in a program of high altitude balloon releases which was designated Operation SKYHOOK. A total of twenty-seven balloons were released in this

<sup>33</sup> Operation Annex, *First Annual Report to the Users of the Churchill Research Range, CRR, Manitoba, Canada, 1 September 1963.*

<sup>34</sup> Operation Annex, *First Annual Report to the Users of the Churchill Research Range, CRR, Manitoba, Canada, 1 September 1963.*

<sup>32</sup> Operations Annex, "CRR Progress & Status Report No. 14," Period 1 July thru 31 July, CRR, Ft. Churchill, Manitoba, Canada, 31 July 1963.

operation for the purpose of obtaining upper atmospheric scientific data. These balloons ranged in size from 1.5 million cubic feet to 9 million cubic feet. The objective of these experiments was to carry aloft, to altitudes of 120,000 to 150,000 feet, scientific payloads consisting of nuclear photographic emulsions, scintillation counters, and cloud chambers in order to study the composition and spectrum of the cosmic radiation at high altitude and high geomagnetic latitude.

#### SOCIOLOGICAL PROBLEMS AT THE CRR

Another aspect of the Churchill range which, while not directly related to rocket launches, took up a good bit of the CRR Commander's time and probably added a few gray hairs to his head, was the sociological problem. This problem has arisen at various times and places since the 1 July 1962 assumption of command by OAR, but probably one of the best examples was found in the field of messing facilities.

To begin with, Fort Churchill, as a Canadian Army installation, had inherent in its make-up a well-defined social stratum and a long history of highly treasured traditions closely patterned after the British Army. With U.S. military personnel there was no problem, they ate in the mess appropriate to their rank--be it Officers', Sergeants' or Other Ranks' Mess. With civilians, and a large number of them at that as the problem was mainly concerned with the PAA employees, the problem became more complex. Especially when many of those civilians were not fully oriented to the military way of life, nor were they particularly aware of any class lines, other than perhaps those artificially created by economic factors.

Colonel Galloway, Canadian commander of Fort Churchill, considered that only top-notch individuals possessing good character traits and occupying managerial positions should be allowed Officers' Mess membership. He also felt that general supervisory personnel should rate Sergeants' Mess

status and all other PAA employees should be members of the Other Rank Mess.<sup>35</sup>

Colonel Flicek had spent four years in a similar situation in Great Britain, so he could more easily appreciate and respect the Canadians' position. Yet as an American he could, of course, understand the lack of "caste consciousness" on the part of the PAA employees. He assured Colonel Galloway that OAR would monitor the whole program to assure that the range contractor employees would adequately fit into that "slice of the social stratum" they more nearly belonged to according to their assignment in PAA.

CRR representatives felt that the conclusions reached after several meetings between U.S. and Canadian representatives were certainly favorable to the range personnel. At that time PAA employees received 22 permanent spaces in the Officers' Mess and 39 in the Sergeants' Mess. In addition, five extra spaces in the Sergeants' Mess were reserved for personnel pending acceptance for Officers' Mess memberships. This solved the problem for a time, although from past experience it was assumed that isolated cases would arise from time to time, calling for individual settlement in each case.

Besides this type of sociological problem there was another of visiting U.S. and Canadian dignitaries, military and civilian, as well as numerous foreign visitors, mostly military but some civilian. In these cases protocol could become as complicated as at an embassy dinner in Washington. From all reports, letters from visitors (U.S. as well as foreign), etc., it would seem that Colonel Flicek and his staff were quite successful in working out the myriad problems that arose, leaving the visitors with the memory of an interesting as well as a pleasant visit to the CRR.

\* \* \* \* \*

This then is the story of the Churchill Research Range and its first year of

<sup>35</sup> Administration Annex, "CRR Progress and Status Report No. 13," Period 16 May to 30 June, CRR, Ft. Churchill, Manitoba, Canada, 30 June 1963.

operation. Starting with the assumption of responsibility for the range on 1 July 1962, OAR can look back over a year in which many outstanding accomplishments took place. On 1 July 1962, the range facilities were very meager and in an advanced state of disrepair. A portion of the facilities at the range head had been gutted by fire in early 1961. OAR, therefore, was faced with the tremendous task of not only rehabilitating the existing facilities, but also of attempting to have the new rangehead complex operational by 1 November 1962.

The period between 1 July and 31 October 1962 was spent repairing existing facilities and equipment, assembling and training personnel, establishing a logistical support system, installing and calibrating equipment and integrating system operations for the new launch complex. The workload was heavy, manpower was in short supply and the operational deadline all too close. Despite these difficulties and those associated with geography and climate, the range was rehabilitated to the point that it was operational on the designated date, even though many discrepancies remained in the rangehead facilities.

Perhaps the most significant progress of any facility at the CRR was that accomplished in providing flexible launch capabilities. On 1 July 1962, CRR's launch capabilities consisted only of the Nike and Arcas launchers. By March 1963, the Universal launcher and building were fully operational. To these facilities were added five outdoor launchers--the Black Brant and the four Nike launchers installed for Operation PROBE HIGH. In addition, the Aerobee launcher was made temporarily operational for the solar eclipse exercise.

The tremendous progress made in the relatively short space of time after the official range reopening on 1 November 1962 can perhaps more readily be appreciated when comparing the types of vehicles that could be accommodated by the launch facilities on 1 November with those types available on 20 July 63. In November the range could only accommodate Arcas, Nike Cajun and Nike Apache rockets. By the time Operation PROBE HIGH (20 July 63) came along the range

could accommodate not only those three, but also the Astrobee 200, Aerobee 100, 150 and 300, Black Brant I, II, III and IV and the Javelin.<sup>36</sup>

From 1 November 1962, the day of the range reopening, until the end of July 1963, a total of 33 rockets were launched from the CRR. In addition to the actual firings, there were 47 aborts, 45 cancellations and eight dry runs.<sup>37</sup>

The Churchill Research Range had come a long way from those bleak days in February 1961 when the range complex was little more than a fire-blackened shell, and when no government agency was showing much interest in taking over management of the range from the U.S. Army. The comparison between then and July 1963 shows a truly noteworthy accomplishment for OAR and the Churchill range, particularly when one recalls the many difficulties which had to be surmounted in a relatively short time by a mere handful of personnel.

The credit for this accomplishment must go to the cooperation of those involved--from the OAR team at Churchill working in close support with the personnel at Hq OAR to the range contractor and the various defense support agencies (Canadian as well as American)--and to the long hours and hard work on the part of those OAR people involved in the operation.

One instance of the dedication of the CRR staff came up during the preparations for Operation PROBE HIGH. Various CRR personnel put off taking planned leave and stayed to get things ready for a successful multi-launch operation during the solar eclipse of 20 July 1963. This at an Air Force installation that is classified as a hardship assignment because of its remoteness from civilization (not even any TV reception) and its rigorous Arctic climate. As is usual in operations like this, however, behind those individuals in the

<sup>36</sup> The size of the range and range safety considerations prevented the launching of the Black Brant IV and Javelin vehicles at that time (July 1963). Later the range boundaries were extended (on an "as needed" basis) to accommodate these vehicles.

<sup>37</sup> Some of the aborts and most of the cancellations at the CRR were due to weather conditions.

limelight are many who labor long and hard for the success of the operation, but remain relatively unknown. So it was with the opening and operation of the Churchill Research Range.<sup>38</sup>

<sup>38</sup> While credit for that achievement rests with many people in several organizations, two officers in particular were singled out by Lt. General James Ferguson, DCS/Research & Technology, USAF, (Ltr. to General Ostrander. Subject: Reopening of the Churchill Research Range, 29 Nov 62.) as the motivating factors behind the successful establishment and subsequent operation of the CRR. These two officers, whose labors were particularly commended, were Colonel Jack W. Streeton and Lieutenant Colonel Claude R. Kimbrel of Hq., OAR. According to General Ferguson the "two officers were designated to carry the initial burdens of providing design criteria for the range and to rapidly build up a good military and contractor management and operations group at the CRR. The opening of the Churchill Research Range on 1 November attests to their professional capabilities."

When the DDR&E abandoned plans to build a new launch complex at Churchill and, instead, decided to rehabilitate the old, fire-damaged launch area, it was assumed by most of those concerned that the range could not be reopened earlier than the summer of 1963. The fact that it was reopened on 1 November 1962 was a remarkable feat in itself and reflected a great deal of credit on both OAR and the Air Force.

But while the rehabilitation of the range signaled the end of one period, it signified the beginning of yet another. For CRR did not plan to rest on its laurels. An extensive program was already planned for FY 64, calling for 77 probe-type rockets for NASA, AFCRL and Canadian research agencies and up to 150 Arcas weather rockets for the metro network and range support.



# APPENDICES

## APPENDIX A

## APPENDIX A

No. 98

The Secretary of State for External Affairs presents his compliments to the Ambassador of the United States of America and has the honour to refer to the Ambassador's Note No. 307 of June 14 concerning the continued utilization of the facilities at Fort Churchill, Manitoba, developed for the International Geophysical Year, for certain joint upper atmosphere research activities and cold weather testing for field army support equipment.

The terms and conditions to govern the use of these facilities proposed in the Ambassador's Note and the Annex to that Note are acceptable to the Canadian Government. The Canadian Government, therefore, concurs in the Ambassador's proposal that his Note and this reply shall constitute an agreement between the Canadian and United States governments, effective from the date of this reply.

OTTAWA, 14 June 1960.

Original initialed by  
N. C. Green

No. 307

The Ambassador of the United States of America presents his compliments to the Secretary of State for External Affairs and has the honor to refer to discussions which have taken place between Canadian and United States authorities concerning the continued utilization of the existing upper atmosphere research facilities at Fort Churchill, Manitoba. These facilities were developed and initially used for research activities of the International Geophysical Year pursuant to the authorization contained in Note No. D-204, of August 29, 1955, from the Department of External Affairs. These discussions have revealed that the mutual interests of Canada and the United States would be advanced by the continued availability of the facilities for the conduct of certain joint upper atmosphere research activities and cold weather testing for field Army support equipment. It is, therefore, proposed that the use of these facilities be in accordance with the conditions set forth in the Annex to this Note. It is understood that any action to be taken by the United States Government in this regard shall be subject to the availability of funds.

If the provisions of the attached Annex meet with the approval of the Government of Canada, it is proposed that this Note and the reply to it constitute an agreement effective as of the date of their exchange.

Embassy of the United States of America,  
Ottawa, June 14, 1960

## ANNEX

### STATEMENT OF CONDITIONS GOVERNING THE MAINTENANCE AND OPERATION OF UPPER ATMOSPHERE RESEARCH AND COLD WEATHER TESTING FACILITIES AT FORT CHURCHILL

(Hereinafter, unless the context otherwise requires, "Canada" means the Government of Canada, the "United States" means the Government of the United States of America, and "facilities" means the range and related installations for upper atmosphere research and cold weather testing at Fort Churchill, Manitoba.)

#### 1. Consultation

(a) The appropriate authorities of the two Governments will consult closely in connection with the operation, use, maintenance and logistic support of the facilities and plans for and location of any additional facilities. Subsequent construction, major improvements to existing buildings, roads, ranges, etc., and the installation of major items of additional equipment shall be agreed between the appropriate authorities of the two Governments.

(b) An Operational Coordinating Group made up of representatives of appropriate departments and agencies of the United States and Canada will be established to facilitate consultation on matters covered by this Statement of Conditions.

#### 2. Operation

(a) As the continued use of the facilities for scientific purposes and cold weather testing for field Army support equipment is in the mutual interest of Canada and the United States, all the activities to be undertaken under this agreement shall, as far as is practicable, be carried out on a joint basis. To this end each Government shall without charge and to the extent compatible with its need, make available to the other such fixed improvements, equipment and services as the appropriate agencies shall agree are necessary to ensure the effective use of the facilities.

(b) Subject to subparagraph 2(a), the United States shall have these rights of operation necessary to ensure the effective use of the facilities and the right to stockpile equipment, material and supplies.

(c) In order to ensure the most effective use of the facilities, the program of tests shall be submitted in advance to the Canadian authorities for their approval.

(d) Any arrangements which might involve use of provincial or private property will be made only through appropriate Canadian Government agencies.

#### 3. Period of Operation

(a) The facilities will be operated in accordance with the provisions of paragraph 2, and the United States may station the personnel provided for in paragraph 5, for a period of five years commencing from the date when this agreement enters into force, or such shorter period as may be agreed upon by the two Governments. After the expiration of the five-year period, in the event that either Government concludes that the facilities are no longer required and the other Government does not agree, the question of continuing need will be referred to the Permanent Joint Board of Defense. Following consideration by the

Permanent Joint Board of Defense, either Government may decide that the facilities in question may be disposed of, in which case the arrangements shown in paragraph 9 below regarding ownership and disposition of the installations shall apply.

(b) Canada reserves the right on reasonable notice to take over responsibility for the operation of any or all of the facilities. Canada will ensure effective operation, in association with the United States, of any facilities it takes over.

4. Financing

The cost of operation and maintenance of the facilities provided and operated by the United States shall be the responsibility of the United States, except as otherwise agreed between the Canadian and United States authorities to take account of Canadian utilization of the facilities.

5. Manning

For the purpose of this agreement, the United States may station personnel in Canada who shall be responsible to the appropriate United States commander at Fort Churchill. It is recognized, however, that the senior Canadian officer at Fort Churchill shall have over-all command and administrative control for all matters relating to the use of the facilities. The number of United States personnel to be stationed at Fort Churchill for the operation and maintenance of the facilities will be a matter for mutual agreement between the appropriate agencies of the two Governments and will, in any case, not exceed the minimum required to operate the facilities effectively.

6. Safety

In establishing operational procedures the utmost precaution shall be taken to ensure that objects fired into the upper atmosphere do not fall in populated areas and that they do not constitute a hazard to aviation or shipping. Range safety requirement and control measures established by appropriate Canadian authorities will be observed.

7. Construction

(a) Procedures for awarding contracts for the improvement of existing facilities or for the construction of any additional facilities and for the procurement of construction equipment, construction supplies and related technical services, shall [be] determined by agreement between appropriate agencies of the two Governments.

(b) Rates of pay and working conditions will be set after consultation with the Canadian Department of Labour in accordance with the Canadian Fair Wages and Hours of Labour Act.

8. Procurement of Electronic Equipment

The Canadian Government reaffirms the principle that electronic equipment at installations on Canadian territory should, as far as practicable, be manufactured in Canada. The question of practicability must, in each case, be a matter for consultation between the appropriate Canadian and United States agencies to determine the application of the principle. The factors to be taken into account shall include availability at the time required, cost, and performance. For the purpose of carrying out this principle, in the event electronic equipment additional to that at present at Fort Churchill will be required, consultation shall take place between appropriate representatives of the two Governments.

## 9. Ownership of Removable Property

Ownership and right of disposal of removable property brought into or purchased in Canada by the United States, including readily demountable structures, shall remain in the United States. The United States shall have the unrestricted right of removing or disposing of all such property at any time, provided that the removal or disposal shall not impair the operation of any installation whose discontinuance has not been determined in accordance with the provisions of paragraph 3, and provided that, if Canada is making continuing and substantial use of any or all of the facilities, the United States is prepared, within the framework of available authority, to enter into suitable alternative arrangements by agreement between the appropriate agencies of the two Governments with respect to all such property located at Fort Churchill for the purpose of ensuring that such Canadian use is not disrupted, and provided further that removal or disposal shall not be delayed beyond a reasonable time after the date on which the operation of the facilities has been discontinued. The disposal of United States excess property in Canada shall be carried out in accordance with the provisions of the exchange of Notes of April 11 and 18, 1951, between the Secretary of State for External Affairs and the United States Ambassador in Ottawa, concerning the disposal of excess property.

## 10. Transportation

Canadian commercial air carriers will be used in the movement of cargo and civilian personnel point-to-point within Canada to the fullest extent practicable, as provided by the "Understanding on the use of civil air transport within Canada", reached on August 6th, 1959, between the United States Air Force and the Department of Transport, or any subsequent amendment to that arrangement.

## 11. Telecommunications

The United States authorities shall obtain the approval of the Canadian Department of Transport for the establishment and operation of radio stations associated with this project and shall establish and operate stations so approved in accordance with the terms of the licenses issued by the Department of Transport. To enable this action to be taken, appropriate license applications are to be forwarded, through Canadian military channels, to the Department of Transport. That Department will require complete technical data concerning the radio stations, including desired frequency assignments, power, class of a mission, bandwidth, number and capacity of circuits, particulars of antenna structures, including marking and lighting, if any.

## 12. Canadian Law

Nothing in this agreement shall derogate from the application of Canadian law in Canada, provided that if in unusual circumstances its application may lead to unreasonable delay or difficulty in the maintenance or operation of the facilities, United States authorities may request the assistance of Canadian authorities in seeking appropriate alleviation. Canadian authorities will give sympathetic consideration to any such request submitted by United States authorities.

## 13. Canadian Immigration and Customs Regulations

(a) Except as otherwise provided, the direct entry of United States personnel from outside Canada shall be in accordance with Canadian customs and immigration procedures which shall be administered by local Canadian officials designated by Canada.

(b) Canada shall take the necessary steps to facilitate the admission into the territory of Canada of such United States citizens as may be employed in the maintenance or operation of the facilities, it being understood that the United States shall undertake to repatriate without expense to Canada any such persons if the contractors fail to do so.

14. Taxes

Canada shall grant remission of customs duties and excise taxes on goods imported and of federal sales and excise taxes on goods purchased in Canada, which are or are to become the property of the United States and are to be used in the maintenance or operation of the facilities. Canada shall also grant refunds by way of drawback of the customs duty paid on goods imported by Canadian manufacturers and used in the manufacture or production of goods purchased by or on behalf of the United States and to become the property of the United States in connection with the maintenance or operation of the facilities.

15. Information

(a) The scientific and technical information derived by the departments and agencies of each Government pursuant to this Agreement shall be made available to the appropriate departments and agencies of the other government.

16. Status of Forces

The Agreement between the Parties to the North Atlantic Treaty regarding the status of their forces signed in London on June 19, 1951, shall apply.

17. Supplementary Arrangements and Administrative Agreements

Supplementary arrangements or administrative agreements between authorized agencies of the two Governments may be made from time to time for the purpose of carrying out the intent of this agreement.

## APPENDIX B



## APPENDIX B

### MEMORANDUM OF AGREEMENT BETWEEN THE UNITED STATES AIR FORCE AND THE UNITED STATES ARMY ON THE TRANSFER OF RESPONSIBILITY FOR THE ROCKET RESEARCH FACILITY AT FORT CHURCHILL, CANADA

1. The Army will begin rehabilitation within a reasonable time of the fire damaged launch complex at the Rocket Research Facility (RRF) at Fort Churchill, Manitoba, Canada, in accordance with the DDR&E memorandum dated 16 February 1962, subject: "Fort Churchill."
2. The Air Force will assume responsibility for the RRF from the Army on 1 July 1962.
3. The Army agrees to phase the withdrawal of its personnel so as to ensure the continuity of operations at the RRF for range users through 1 July 1962. The Air Force agrees to phase in personnel in sufficient strength to assume RRF management by 1 July 1962. Phasing plans will be worked out between the Air Force Office of Aerospace Research (OAR) and the Army Office of the Chief of Ordnance (OCO).
4. All facilities of the RRF for which the Army is responsible will be transferred on a non-reimbursable basis to the Air Force by 1 July 1962.
5. The Army will transfer on a non-reimbursable basis to the Air Force all equipment, support aircraft, supplies, spares and other materiel required for the support of the operation of the RRF, and the Army will not hereafter remove any such materiel from the RRF without prior Air Force approval. Resupply responsibility will be transferred on a phased basis to be worked out between OAR and OCO.
6. The Army will transfer certain nonappropriated fund property and supplies to the Air Force. OAR and OCO will work out the details in accordance with joint guidance to be provided by the Air Force and Army Headquarters agencies respectively concerned with nonappropriated fund property.
7. The Army will provide funds up to \$75,000 to the Air Force to assume certain agreed operating and support functions prior to 30 June 1962.
8. The OAR and OCO will develop a comprehensive joint plan for the transfer of responsibility for management and operation of the RRF to implement this agreement. This plan will be submitted prior to 1 May 1962 to the Chief of Staff of Army for review and approval.

SUBJECT TO THE AMENDMENT BELOW:

s/Curtis E. LeMay  
Chief of Staff  
United States Air Force

Date signed: 20 March 1962

s/G. H. Decker  
Chief of Staff  
United States Army

Date signed: 2 Apr 1962

### AMENDMENT

For purposes of clarification, the following interpretations of paragraphs 5 and 8 of the foregoing text are agreed to:

a. Materiel referred to in paragraph 5 is limited to that now being used by the RRF or now located at Fort Churchill for the conduct and support of RRF operations.

b. With respect to paragraph 8, it is understood that the joint plan to be developed by OCO and OAR will include details pertaining to the transfer of the materiel referred to in paragraph 5.

s/Curtis E. LeMay  
Chief of Staff  
United States Air Force

Date signed: 13 April 1962

s/ G. H. Decker  
Chief of Staff  
United States Army

Date signed: 2 April 1962

## APPENDIX C

REVISED: 18 May 1962  
EFFECTIVE: 1 July 1962

## APPENDIX C

### TERMS OF REFERENCE FOR THE CANADA-UNITED STATES OPERATIONAL COORDINATING GROUP FOR THE ROCKET RESEARCH FACILITY FORT CHURCHILL, MANITOBA, CANADA

#### AUTHORITY

1. Paragraph 1b of the inter-governmental agreement between the United States and Canada with respect to the combined operation of a rocket research facility at Fort Churchill states:

"An Operational Coordinating Group made up of representatives of appropriate departments and agencies of the United States and Canada will be established to facilitate consultation on matters covered by this Statement of Conditions."

#### PURPOSE

2. The purpose of the Operational Coordinating Group (OCG) is to:
  - a. Coordinate the programmes of all governmental and non-governmental agencies of Canada and the United States authorized to use the Rocket Research Facility (RRF) at Fort Churchill, Manitoba, Canada.
  - b. Facilitate consultations between appropriate agencies of Canada and the United States with respect to matters covered by the Statement of Conditions to the inter-governmental agreement.

#### COMPOSITION

3. The OCG shall be comprised of seven members. The group shall be chaired by the Office of the Secretary of Defense member. Membership shall be:
  - a. The United States Department of Defense (DOD) -2
  - b. The United States National Aeronautics and Space Administration (NASA) -2
  - c. The Canadian Army -2
  - d. The Canadian Defence Research Board (DRB) -1
  - e. Additional representatives of governmental or non-governmental agencies, including the agencies listed above, may be invited to attend meetings of the OCG as advisors and/or observers.

## FUNCTIONS

4. The functions of the Operational Coordinating Group shall be as follows:
  - a. To coordinate use of the Rocket Research Facility at Fort Churchill.
  - b. To investigate and recommend procedures and policies with respect to public relations; channels of communication; responsibilities for financing, manning, safety, construction; and any additional matters relating to the operation of the Rocket Research Facility.
  - c. To facilitate consultations between appropriate agencies of the United States and Canada on matters covered by the Statement of Conditions to the inter-governmental agreement.
  - d. To report its activities and recommendations to the United States National Aeronautics and Space Administration and Department of Defense and to the Department of National Defence in Canada.

## APPENDIX D

APPENDIX D

ADMINISTRATIVE AND FINANCIAL AGREEMENT BETWEEN

THE CANADIAN ARMY (REGULAR)

AND

THE UNITED STATES AIR FORCE

MAINTENANCE AND OPERATION OF THE CHURCHILL RESEARCH RANGE

AT FORT CHURCHILL, MANITOBA, CANADA

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**ADMINISTRATIVE AND FINANCIAL AGREEMENT BETWEEN  
THE CANADIAN ARMY (REGULAR)**

**AND**

**THE UNITED STATES AIR FORCE**

**FOR**

**MAINTENANCE AND OPERATION OF THE CHURCHILL RESEARCH RANGE  
AT FORTH CHURCHILL L. MANITOBA, CANADA.**

**GENERAL**

**1. a. Intergovernmental Agreement of 14 Jun 60**

By and exchange of correspondence on 14 Jun 60 the Governments of Canada and the United States agreed to the continued utilization of the facilities at Fort Churchill, now known as the Churchill Research Range, for the conduct of certain joint upper atmosphere research activities and cold weather testing for field army support equipment. Paragraph 17 of the 'Statement of Conditions Governing the Maintenance and Operation of Upper Atmosphere Research and Cold Weather Testing Facilities at Fort Churchill', which forms the annex to the intergovernmental agreement, authorizes the making of supplementary arrangements or administrative agreements between authorized agencies of the two governments for the purpose of carrying out the intent of the agreement.

**b. Canadian Joint Organization Order for Fort Churchill**

(1) Fort Churchill, Manitoba, Canada, is a Canadian joint services station. The Chief of the General Staff of the Canadian Army is responsible to the Canadian Chiefs of Staff Committee for the overall command and administration of the station.

(2) A Joint Organization Order is issued, from time to time, under the authority of the Canadian Chiefs of Staff Committee which defines:

(a) The responsibilities and commitments of the various services and agencies involved in training, tests, trials, research or operational duties at Fort Churchill, and/or the administrative support of these activities.

(b) The arrangements under which facilities and services are provided and used in common.

**c. Status of Forces**

The Agreement between the Parties to the North Atlantic Treaty regarding the status of their forces signed in London on June 19, 1951, shall apply.

## PURPOSE

2. The purpose of the Administrative and Financial Agreement between the Canadian Army (Regular), hereinafter called the CA(R), and the United States Air Force, hereinafter called the USAF, is to set out the arrangements made between the CA(R), which administers and commands Fort Churchill, and the USAF, which is the United States agency charged with the responsibility for the operation and maintenance of the Churchill Research Range, hereinafter called the CRR, for the administrative support of the CRR by the CA(R). This agreement amplifies and confirms the provision of the Canadian Joint Organization Order, insofar as the CRR is concerned, within the limitations of the intergovernmental agreement mentioned in paragraph 1 a. above. In the event of conflict between any item in this agreement and a similar item in the Joint Organization Order this agreement will take precedence.

## CHANGES

3. Either the CA(R) or the USAF may, at any time, initiate discussions to revise this agreement within the limitations of the intergovernmental agreement mentioned in paragraph 1 a. above.

## DURATION

4. This agreement shall be effective from the date of final acceptance to the expiration of the intergovernmental agreement mentioned in paragraph 1 a. above, provided that the USAF and the CA(R) continue to be the United States and Canadian agencies involved. In the event that the United States should designate another US agency as being responsible for the operation and maintenance of the CRR or the Canadian Chiefs of Staff should designate another Canadian Service as being responsible for overall command and administration at Fort Churchill this agreement will be terminated as of the date responsibility is transferred to such other agency or service.

## CONSULTATION

5. An Operational Coordinating Group (OCG) for the CRR, Fort Churchill, Canada has been established, in accordance with paragraph 1 b. of the intergovernmental agreement referred to in paragraph 1 a. above, for the purpose of facilitating consultation on matters covered by the Statement of Conditions which form the annex to the agreement. The normal channel of communication between the United States and Canada on matters concerned with this agreement will be between the USAF and CA(R) representatives on the OCG. This does not preclude the USAF Commanding Officer CRR from negotiating on such matters with Commander, Fort Churchill prior to reference, if necessary, to their respective superior headquarters.

## EQUIPMENT AND SUPPLIES

6. a. The USAF shall have the right to stock equipment, material and supplies in sufficient quantities to support the CRR activities.
- b. At the discretion of the USAF Commanding Officer of the CRR such equipment prestocked by the USAF may be used by the CA(R). Such use shall be subject to the following conditions:
  - (1) The CA(R) shall maintain the equipment.

- (2) The equipment shall be available for immediate support of the CRR in the event of an emergency.
- (3) Subject to (4) below the USAF shall furnish replacement parts and pieces of equipment that have been rendered unserviceable as a result of normal wear and tear.
- (4) When damage to the equipment is attributable to the negligence, incompetence or wilful acts of members of the CA(R) or its agencies the equipment shall be replaced by the USAF at the expense of the CA(R).

#### MANNING

7. USAF manning inclusive of contractor personnel at the CRR will be as agreed between the CA(R) and the USAF and in accordance with intergovernmental agreements. The agreed figures will be reflected in the Canadian Joint Organization Order and will not be exceeded without prior concurrence of the CA(R). Civilian personnel changes will be coordinated with the CA(R).

#### CIVILIAN PERSONNEL

8. a. The USAF may employ a civilian contractor as its agent, in accordance with intergovernmental agreements, to perform any of the functions associated with the maintenance and operation of the CRR. The USAF Commanding Officer CRR will be responsible for the supervision of the contractor and the employees of the contractor. All communication with the Commander, Fort Churchill about matters concerning the contractor or his employees will be through the Commanding Officer CRR.
- b. The USAF operations and maintenance contractor will normally make his own arrangements for the employment of civilians. Rates of pay and working conditions for Canadian civilian employees will be set after consultation with the Canadian Department of Labour in accordance with the Canadian Fair Wages and Hours of Labour Act, in accordance with paragraph 7 (b) of the intergovernmental agreement.
- c. All civilians at Fort Churchill engaged by the USAF or its agent(s) for employment with the Churchill Research Range or associated with the operations of the CRR either permanently or temporarily shall be subject to all camp orders and regulations, applicable to civilians at Fort Churchill, issued by the Commander, Fort Churchill or other authority.

#### CUSTOMS AND IMMIGRATION

9. Canadian customs and immigration procedures with respect to US personnel, supplies, and equipment utilized in connection with CRR activities shall be in accordance with paragraphs 13 and 14 of the annex to the intergovernmental agreement mentioned in paragraph 1.

#### SHIPPING AND RECEIVING

10. The USAF will prepare and issue appropriate US Government Bills of Lading and travel requests for US personnel and material in accordance with the existing regulations.

Movement of furniture and effects will be coordinated with the Commander, Fort Churchill in the same way the movement of furniture and effects is coordinated for all other Services and Agencies.

#### CONSTRUCTION

11. a. The base master plan shall be the responsibility of the CA(R) and the development of facilities to meet the CRR mission will be coordinated with the CA(R).
- b. All CRR construction shall be coordinated with the CA(R) and shall meet Canadian Army minimum standards for structural and fire safety.
- c. Ownership and disposal of all US removable property associated with the CRR shall be in accordance with paragraph 9 of the intergovernmental agreement referred to in paragraph 1 above.

#### WORK SERVICES

##### 12. a. Minor Construction and Maintenance of Buildings and Structures

USAF (CRR) will be responsible for all construction and maintenance of USAF (CRR) owned buildings and structures. The relevant portion(s) of the Canadian Joint Organization Order will apply insofar as assistance by the CA(R) is concerned.

##### b. Route Maintenance

The CA(R) is responsible for:

- (1) Route maintenance on the road to the CRR launch facility and beyond to the Twin Lakes instrumentation site.
- (2) Snow removal to inclusive the radar site (about Mile 5).

The USAF (CRR) is responsible for snow clearance beyond the radar site. The CA(R) will assist the USAF in snow clearance when asked and if feasible.

##### c. Utilities

The CA(R) is responsible for providing the following utilities with no financial recovery:

- (1) Heat, electrical power, water and sewage within the campsite proper.
- (2) Water and conservancy service for the CRR launch facility.

The USAF (CRR) is responsible for providing heat and electrical power for the CRR sites outside the campsite proper.

##### d. Fire Protection

- (1) The Commander, Fort Churchill is responsible for the overall arrangements for fire prevention and fire fighting.

- (2) The Canadian Army will provide fire fighting services without financial recovery within the campsite proper and will assist elsewhere. The USAF (CRR) will be responsible for fire fighting service at all CRR facilities outside the campsite proper.

#### COMMUNICATIONS - ELECTRONICS

13. a. The procurement of electronics equipment will be in accordance with paragraph 8 of the intergovernmental agreement referred to in paragraph 1. a. above.
- b. The provision of communication and electronic facilities shall be governed by the relevant sections of the current Canadian Joint Organization Order for Fort Churchill and paragraph 11 of the intergovernmental agreement referred to in paragraph 1. a. above.
- c. Frequency assignments necessary for the operation of all communications - electronics equipment needed to support CRR requirements shall be channeled through the Joint Frequency Allocation Panel.

#### VEHICLE AND TECHNICAL STORES - PROVISION, MAINTENANCE AND REPAIR

14. The provision, maintenance and repair of vehicles and technical stores required for the CRR will be the responsibility of the USAF (CRR). The Canadian Army may assist in accordance with the relevant paragraphs of the Joint Organization Order.

#### PETROLEUM, OIL, LUBRICANTS (POL)

15. The CA(R) will provide all POL products including fuel oil for heating purposes outside of the Camp proper, on a recoverable basis. Invoices for all POL products will be given to the Commanding Officer CRR, who will then send them to the appropriate US authority for payment.

#### RANGE SAFETY

16. The Commander, Fort Churchill, is responsible for the overall range safety requirements and control measures at the CRR. A Canadian Army Officer, who will be designated by the Commander, Fort Churchill as range safety officer for the CRR, will give a safety clearance for all firings before they occur.

#### INFORMATION

17. The release of information about the CRR, or arising from CRR activities, to other departments and agencies of the Canadian and United States Governments and to the public shall be coordinated through the Operational Coordinating Group and shall be in accordance with paragraph 15 of the intergovernmental agreement and the relevant sections of the Canadian Joint Organization Order.

#### LOCAL ADMINISTRATION

18. a. Command

The USAF shall retain command of all USAF personnel associated with the CRR. The responsibilities of the Commander, Fort Churchill for overall command and

administration is, however, not affected by this agreement. Command will be exercised in accordance with the relevant paragraphs of the Canadian Joint Organization Order.

b. Discipline

Discipline and order will be maintained in accordance with the relevant paragraphs of the Canadian Joint Organization Order.

c. Security and Security Clearances

- (1) The USAF Commanding Officer of the CRR will ensure that security measures adopted within the CRR conform to the overall security plan for Fort Churchill.
- (2) Security clearance of personnel proceeding to or serving at Fort Churchill is governed by CAO 255-16.
- (3) Security Clearance - Civilians. - The USAF Commanding Officer of the CRR has the authority to grant or deny a security clearance to any person(s), US or Canadian, employed by the USAF. The USAF shall designate those positions which will be occupied by civilian personnel who require a security clearance. Responsibility for investigation for purposes of security clearance of civilian personnel shall be the USAF for US nationals, and the CA(R) for Canadian nationals. Final acceptance for hire will be the responsibility of the USAF Commanding Officer of the CRR.

d. Permanent Married Quarters

There are not sufficient married quarters at Fort Churchill to permit allocation to all entitled personnel. The allocation of such quarters is controlled by the Commander, Fort Churchill, in accordance with the policy laid down by the Canadian Chiefs of Staff Committee. Quarters allocated to US military personnel and/or to civilians will be paid for at the rates prescribed in the financial portion of this agreement.

e. Private Vehicles

USAF personnel and civilians associated with the CRR are permitted to have private vehicles on the station subject to the same terms, conditions, and regulations as are applicable to Canadian Service personnel.

f. Fire Arms

The USAF shall be permitted importation of military weapons for USAF personnel as required to carry out agreed defence responsibilities. Privately owned weapons are permitted in accordance with Canadian law under the same terms applicable to Canadian personnel on the base.

g. Recreational Facilities and Amenities

- (1) All recreational facilities and station amenities may be used by US military and civilian personnel associated with the CRR and their dependents under the same conditions as those applying to Canadian military and civilian personnel and their dependents.
- (2) No USAF base exchange shall be established.

h. Medical Services

USAF (CRR) military personnel and their dependence will be provided medical and dental care in accordance with applicable arrangements between the Canadian and US Services. USAF (CRR) contractor personnel, including their dependents, will be provided medical and dental care as is authorized for and provided to dependents of Canadian military personnel on a reimbursable basis by persons involved.

j. Single Accommodation and Messing

The CA(R) will be responsible for accommodation and messing. Charges for rations and/or quarters will be as indicated in the financial portion of this agreement.

ACCOUNTING AND FINANCE

19. a. The Commanding Officer CRR will approve all demands for supplies and services and will direct these to the Commander, Fort Churchill, or his appropriate representative. The Commanding Officer CRR will be responsible to arrange all reimbursements for services and supplies.
- b. The following is a description of the supplies and services for which financial recovery will be made:
  - (1) In the event that civilians are hired by the Canadian Army to support the CRR or to augment the USAF (CRR) staff, recovery will consist of the actual salaries paid plus allowances and costs of recruiting.
  - (2) Costs of telecommunication services including long distance tolls exclusive of the normal communications services operated by the Canadian Army and which are part of the campsite proper facilities.
  - (3) Laundry and dry cleaning charges in accordance with the normal Canadian Army rates.
  - (4) Supplies and equipment including POL purchased by the USAF from Canadian Army sources at current catalogue prices or the actual cost of those items specially purchased for USAF account. A 3½% accessorial charge will be added to cover handling charges. Where items are specially ordered and, at the request of the USAF, transported to Fort Churchill by unusual means such as air express, these additional charges will be recovered.
  - (5) Construction and maintenance of USAF (CRR) buildings exclusive of jointly occupied accommodation in the campsite proper will be recovered in accordance with actual contract price and/or from job costs sheets indicating man hours and materiel used.
  - (6) Permanent married quarters allotted by the Commander, Fort Churchill, to USAF Service personnel will be charged at the rate for equivalent ranks for the Canadian Forces.

- (7) Civilians employed by the USAF or an agent of the USAF will be charged for rations and/or quarters as follows:
- (a) If occupying permanent married quarters, at the rate of \$128.00 per month.
  - (b) If occupying single quarters, at the rates as indicated in the Civilian Personnel Administration and Accounting Manual, and \$50.00 per month for prepared rations, exclusive of normal mess charges and subscriptions.
- (8) Charges for rations for USAF service personnel will be \$1.30 per man per day plus applicable catering costs in the Men's Mess and mess subscription rates in the NCO's and Officers' Mess. Arrangements may be made whereby USAF officers pay these charges in cash locally. Charges for other ranks will be billed to the USAF.
- (9) Billings for services and supplies provided to the USAF (CRR) will be prepared monthly by Commander, Fort Churchill and will be forwarded to the Commanding Officer CRR for his review and approval. Following such approval, the billings will be forwarded to the appropriate USAF Accounting and Finance Officer for settlement.
- (10) Supplies and equipment obtained for the USAF may include in their price certain Canadian import or excise taxes. Since these taxes are imposed at the point of manufacture they are not readily identifiable in the retail purchase price and/or catalogue price. If the volume of USAF purchases is great enough to warrant the administrative costs of computing and filing for rebate this will be done.

20. USAF (CRR) helicopter support of CA(R) activities at Fort Churchill will be negotiated between the Commander, Fort Churchill and the Commanding Officer, CRR subject to the limitations of the contract with the range operator. Such support will be arranged only on a non-interference basis with the operation of the USAF (CRR). Use of hangar facilities of the RCAF is authorized on a space-available basis without reimbursement. In addition, on the basis of non-interference with the primary mission of the RCAF at Fort Churchill, the RCAF is authorized to provide in accordance with current agreements and from which existing capabilities such assistance and facilities as may be requested by the USAF (CRR).

21. The Defence Research Board, as one of the range users, will furnish assistance and facilities to the CRR through the Defence Research Northern Laboratory, within their capabilities and without prejudice to their mission.

Accepted and signed on 23 day of April 1963

For the Canadian Army (Regular) s/G. Walsh  
(G Walsh)  
Lieutenant-General  
Chief of the General Staff

For the United States Air Force s/Curtis E. LeMay  
CURTIS E. LeMAY  
General, USAF  
Chief of Staff



## GLOSSARY

AFCRL	Air Force Cambridge Research Laboratories
AFOSR	Air Force Office of Scientific Research
AFRDR-AS	Air Force Director of Science and Technology-Astronautics Division (earlier designation)
AFRST-SC	Air Force Director of Science and Technology-Science Division (present designation)
AMR	Atlantic Missile Range
AOMC	Army Ordnance Missile Command
ARPA	Advanced Research Projects Agency
ASA (R&D)	Assistant Secretary of the Army (Research & Development)
BOD	Beneficial Occupancy Date
CE	U.S. Army Corps of Engineers
cps	cycles per second
CRR	Churchill Research Range
CY	Calendar Year
DCL	Defence Construction Limited (Canada)
DCS	Deputy Chief of Staff
DDR&E	Director of Defense Research and Engineering
DOD	Department of Defense
DoVAP	Doppler, Velocity & Position System
DRB	Defence Research Board (Canada)
DRNL	Defence Research Northern Laboratories (Canada)
EOD	Eastern Ocean District
FY	Fiscal Year
GCA	Geophysics Corporation of America
GSFA	Goddard Space Flight Center
Hq.	Headquarters
<i>Ibid.</i>	in the same place
IGY	International Geophysical Year
IRIG	Inter-Range Instrumentation Group
IRM	Integrated Range Mission
Kev	thousand electron volts

km	kilometer
MDW	Military District of Washington
NASA	National Aeronautics and Space Administration
NORAD	North American Air Defense Command
OAR	Office of Aerospace Research
OCG	Operational Coordinating Group
OCRD	Office of the Chief of Research and Development
ONR	Office of Naval Research
OPI	Office of Primary Interest
OSD	Office of the Secretary of Defense
PAA	Pan American World Airways
pps	pulse per second
RCAF	Royal Canadian Air Force
R & D	Research and Development
RF	radio frequency
RRF	Rocket Research Facility
RSGS	Ranges & Space Ground Support
SAC	Strategic Air Command
SARAH	Search and Rescue and Homing System
SOTIM	Sonic Observation of the Trajectory and Impact of the Missile
USA	U.S. Army
USAATC	U.S. Army Arctic Test Center
USAF	United States Air Force
USAOATA	U.S. Army Ordnance Arctic Test Center
WSMR	White Sands Missile Range

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